MINI-SPLIT SYSTEMS SERVICE MANUAL

MCB/MWCB and MHB/MWHB Series Diagnostic Information

100042 5/2022

Please refer to 100041 for indoor and outdoor unit information.

MWCB / MWHB Wall Mount Single-Zone Indoor Unit

MCB / MHB Single-Zone Outdoor Units

Table of Contents

⚠WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life.

Installation and service must be performed by a licensed professional HVAC installer (or equivalent) or service agency

1. Safety Considerations

⚠WARNING

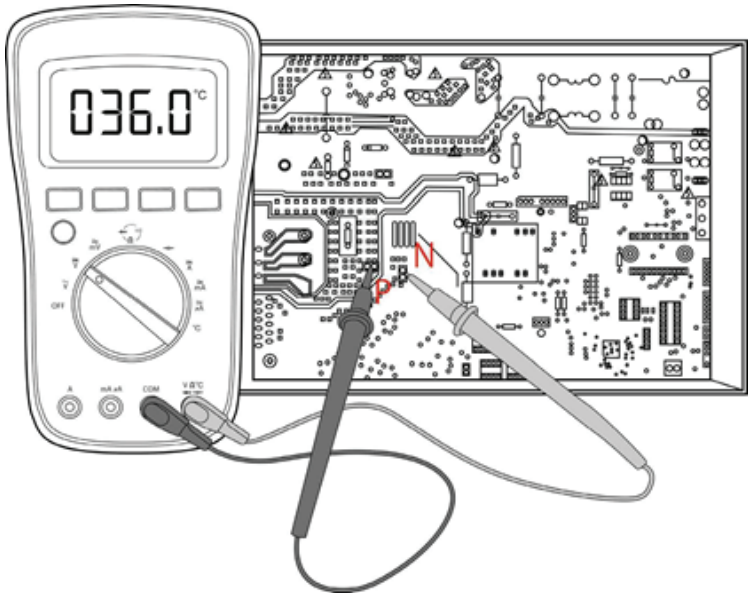
Electric Shock Hazard. Can cause injury or death. Unit must be rounded in accordance with national and local codes.

Line voltage is present at all components when unit is not in operation. Disconnect all remote electric power supplies before opening access panel. Unit may have multiple power sources.

⚠WARNING

Electricity remains in capacitors even when the power supply is off. Ensure the capacitors are fully discharged before troubleshooting.

Test the voltage between P and N on back of the main PCB with multimeter. If the voltage is 36V, the capacitors are fully discharged



2. General Troubleshooting

2.1. Error Codes

When the indoor unit encounters detects an error condition the running LED with flash in a corresponding series, the timer LED may turn on or begin flashing and display the error code. These error codes are described in the following tables:

Table 1. Indoor Display Alert and Status Codes and Outdoor Unit LED

Unit Error Codes	Outdoor Unit Main Control Board	Indoor Unit Display	Solution
	MCB	MWCB	
System Error Codes			
Indoor unit EEPROM error	n/a	EH 00	See “4.1. TS01-IDU” on page 8.
Indoor unit EEPROM parameter error	n/a	EH 0A	
Communication error between indoor unit and outdoor units	n/a	EL 01	See “4.3. TS02-S-INV” on page 9.
Indoor fan speed error (DC motor)	n/a	EH 03	See “4.4. TS04-S-IDU” on page 10.
Indoor room temperature sensor error (T1)	n/a	EH 60	See “4.6. TS05-IDU” on page 14.
Indoor coil temperature sensor error (T2)	n/a	EH 61	
Refrigerant leakage detection (Cooling mode only)	n/a	EL 0C	See “4.8. TS06-INV” on page 16.
Outdoor current overload protection	n/a	PC 08	See “4.10. TS08-S” on page 17.
Outdoor ambient temperature sensor error (T4)	n/a	EC 53	See “4.7. TS05-ODU” on page 15.
Outdoor coil temperature sensor error (T3)	n/a	EC 52	
Compressor discharge temperature sensor error (TP)	n/a	EC 54	
Outdoor unit EEPROM error	n/a	EC 51	See “4.2. TS01-ODU” on page 8.
Outdoor unit fan speed error (DC fan motor)	n/a	EC 07	See “4.5. TS04-S-ODU” on page 13.
Inverter module IPM error	n/a	PC 00	See “4.11. TS09-S” on page 18.
High or Low voltage protection	n/a	PC 01	See “4.12. TS10-S” on page 19.
Compressor drive error	n/a	PC 04	See “4.13. TS12-S” on page 20.
Standby	SLOW FLASH	n/a	
Normal operation	LIT	n/a	
Outdoor unit error	FAST FLASH	n/a	
Communication error between main control board and display board	n/a	EH 0b	See “4.9. TS07” on page 16.
Operational Status Codes			
46F heat mode (Heat pumps models only)	n/a	FP	
Force Cooling	n/a	FC	
Remote or Wired controller Lock	n/a	LL	
Defrost (Heat pumps models only)	n/a	dF	
Active clean	n/a	CL	
Time On	n/a	On	
Time Off	n/a	OF	
Anti-cold Air Flow (Heat pumps models only)	n/a	cF	
Remote On/Off	n/a	CP	
ECO mode	n/a	On display 3 seconds	
Outdoor Unit LED: Slow flash: Flashing at 1Hz Fast flash: Flashing at 2Hz			

2.2. Complaint Form

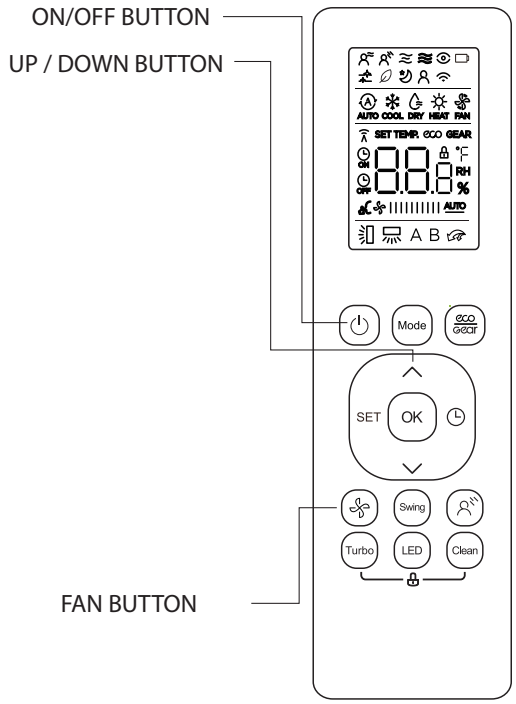
Request Number:		Telephone Number:	
Home Address:			
Email:			
Product Information			
Indoor Unit Model:		Outdoor Unit Model:	
Outdoor Unit Serial #			
Indoor Unit Serial #			
Operation Mode:	☐ Cooling ☐ Heating ☐ Fan Only ☐ Dry		
Temperature Setting:	_ _ ºF	Fan Speed:	☐ Turbo ☐ High ☐ Medium ☐ Low ☐ Auto
Temperature at Return	_ _ ºF	Temperature at Discharge:	_ _ ºF
Installation / Condition Information			
Indoor Temperature	_ _ ºF	Indoor Humidity	_ _ % RH
Outdoor Temperature	_ _ ºF	Outdoor Humidity	_ _ % RH
Piping Length		Pipe Diameter	Gas Pipe: Liq Pipe:
Wiring Length		Wire Gauge	
System Running Pressure	MPa: _ _ Bar: _ _ PSI: _ _		
Room Size (L*W*H)			
Indoor Unit Installation Photo		Outdoor Unit Installation Photo	

Failure Descriptions		
Issue	**Indoor Unit Error Code**	**Outdoor Unit Error Code**
Unit does not start.		
Remote control does not work.		
Indoor display is blank.		
No cooling or heating.		
Insufficient cooling or heating.		
Unit Starts but stops immediately.		
Excessive noise.		
Excessive vibration		

Wireless Remote Parameter Checking Information			
Code being Displayed	**Description**	**Display Value**	**Description**
T1	Room temperature		
T2	Indoor coil temperature		
T3	Outdoor coil temperature		
T4	Ambient temperature		
TP	Discharge temperature		
FT	Target frequency		
Fr	Actual frequency		
d1	Compressor current		
Uo	Outdoor AC voltage		
Sn	Indoor capacity test		
Pr	Outdoor fan speed		
Lt	EXV opening steps		
ir	Indoor fan speed		
HU	Indoor humidity		
TT	Adjusted temperature settings		
oT	GA algorithm frequency		

2.3. Engineering Mode for System Query

- To enter engineer mode, in power-on or standby mode and in non-locked state, using the wireless remote control, press the key combination **ON/OFF** button and **FAN** button for 7 seconds.
- After entering the engineer mode, the wireless remote control will display the following icons (Auto, Cool, Dry, Heat and the Battery) at the same time. In addition, will also display the numeric code of the current engineer mode (engineer mode startup mode will display numeric code 0).
- In engineer mode, the value of the current numeric code can be adjusted using the **Up/Down** button. The ranges of codes are O to 30.
- To exit engineer mode, using the wireless remote control, press the key combination **ON/OFF** button and **FAN** button for 2 seconds.
- Engineering mode will automatically end if there is no valid key operation for 60 seconds.



2.3.1. Engineering Mode Codes

Table 2. Engineering Mode Codes

Display Code	Query Content	Description
0	Default start code that will be displayed when going into engineering mode.	
1	Room temperature	T1 temperature
2	Indoor coil temperature	T2 temperature
3	Outdoor coil temperature	T3 temperature
4	Ambient temperature	T4 temperature
5	Discharge temperature	TP temperature
6	Compressor Target Frequency FT	Targeted Frequency
7	Compressor Running Frequency Fr	Actual Frequency
8	Unit Current dl	N/A
9	Outdoor AC Voltage Uo	N/A
10	Current indoor capacity test state Sn	N/A
11	Reserve	
12	Set Speed Pr of the outdoor fan	Outdoor fan speed=value*8
13	Opening Lr of EEV	EXV opening angle-value*8
14	Actual Running Speed ir of the indoor fan	Indoor fan speed=value*8
15	Indoor Humidity Hu	N/A
16	Set Temperature TT after compensation	N/A
17 - 19	Reserve	
20	Indoor Target Frequency oT	N/A
21 - 30	Reserve	

2.3.2. Engineering Mode Error Codes

Table 3. Engineering Mode Error Codes

Coded Description	Code
Indoor unit EEPROM error	EH 00/EH 0A
Communication error between indoor unit and outdoor units	EL 01
Indoor fan speed error (DC motor)	EH 03
Indoor room temperature sensor error (T1)	EH 60
Indoor coil temperature sensor error (T2)	EH 61
Refrigerant leakage detection (Cooling mode only)	EL 0C
Communication error between main control board and display board	EH 0b
Outdoor current overload protection	PC 08
Outdoor ambient temperature sensor error (T4)	EC 53
Outdoor coil temperature sensor error (T3)	EC 52
Compressor discharge temperature sensor error (TP) or sometimes referred to as (T5)	EC 54
Outdoor unit EEPROM error	EC 51
Outdoor unit fan speed error (DC fan motor)	EC 07
Inverter module IPM error	PC 00
High or Low voltage protection	PC 01
Outdoor low ambient temperature protection	PC 0L
Compressor drive error	PC 04
Outdoor ambient temperature too low	PC 0L

3. Quick Maintenance by Error Code

The following is a part replacement matrix based on the active error code.

Table 4. Component Replacement Based on Error Code (Part 1)

Part Requiring Replacement	Error Code							
	EH 00 / EH 0A	EL 01	EH 03	EH 60	EH 61	EH 0b	EL 0C	PC 08
Indoor PCB	√	√	√	√	√	√	√	X
Outdoor PCB	X	√	X	X	X	X	X	√
Display board	X	X	X	X	X	√	X	X
Indoor fan motor	X	X	√	X	X	X	X	X
T1 sensor	X	X	X	√	X	X	X	X
T2 sensor	X	X	X	X	√	X	√	X
T2B sensor	X	X	X	X	X	X	X	X
Reactor	X	√	X	X	X	X	X	X
Compressor	X	X	X	X	X	X	X	√
Additional refrigerant	X	X	X	X	X	X	√	X

Table 5. Component Replacement Based on Error Code (Part 2)

Part Requiring Replacement	Error Code							
	EC 53	EC 52	EC 54	EC 51	EC 07	PC 00	PC 01	PC 04
Indoor PCB	√	√	√	√	√	√	√	√
Outdoor PCB	X	X	X	X	X	X	X	X
Outdoor fan motor	X	X	X	X	√	√	X	√
T3 sensor	X	√	X	X	X	X	X	X
T4 sensor	√	X	X	X	X	X	X	X
TP sensor	X	X	√	X	X	X	X	X
Reactor	X	X	X	X	X	X	√	X
Compressor	X	X	X	X	X	√	X	√
IPM module board	X	X	X	X	X	√	√	√
High pressure protector	X	X	X	X	X	X	X	X
Low pressure protector	X	X	X	X	X	X	X	X
Additional refrigerant	X	X	X	X	X	X	X	X

NOTE: *For certain models, the outdoor PCB can not be removed separately. In this case, the outdoor electric control box should be replaced as a whole.*

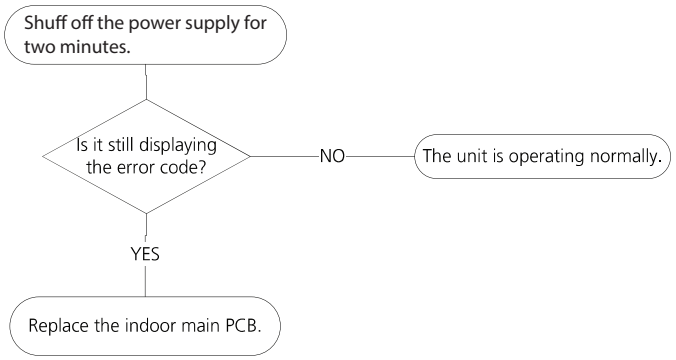
4. Troubleshooting by Error Code

4.1. TS01-IDU

Description: Indoor PCB main chip is not receiving feedback from the EEPROM chip.

Possible Affected Components: Outdoor PCB

Troubleshooting and Repair:



Remarks: A read-only memory that can be erased and reprogrammed using a pulsed voltage.

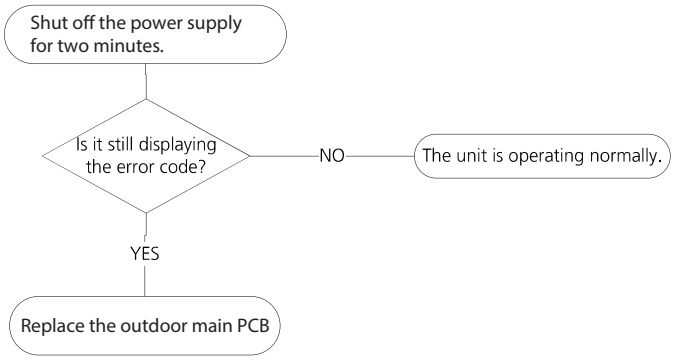
NOTE: *On various models the indoor PCB can not be removed separately. In this situation the entire indoor electric control box should be replaced.*

4.2. TS01-ODU

Description: Outdoor PCB main chip is not receiving feedback from the EEPROM chip or compressor driven chip.

Possible Affected Components: Outdoor PCB

Troubleshooting and Repair:



Remarks: A read-only memory that can be erased and reprogrammed using a pulsed voltage.

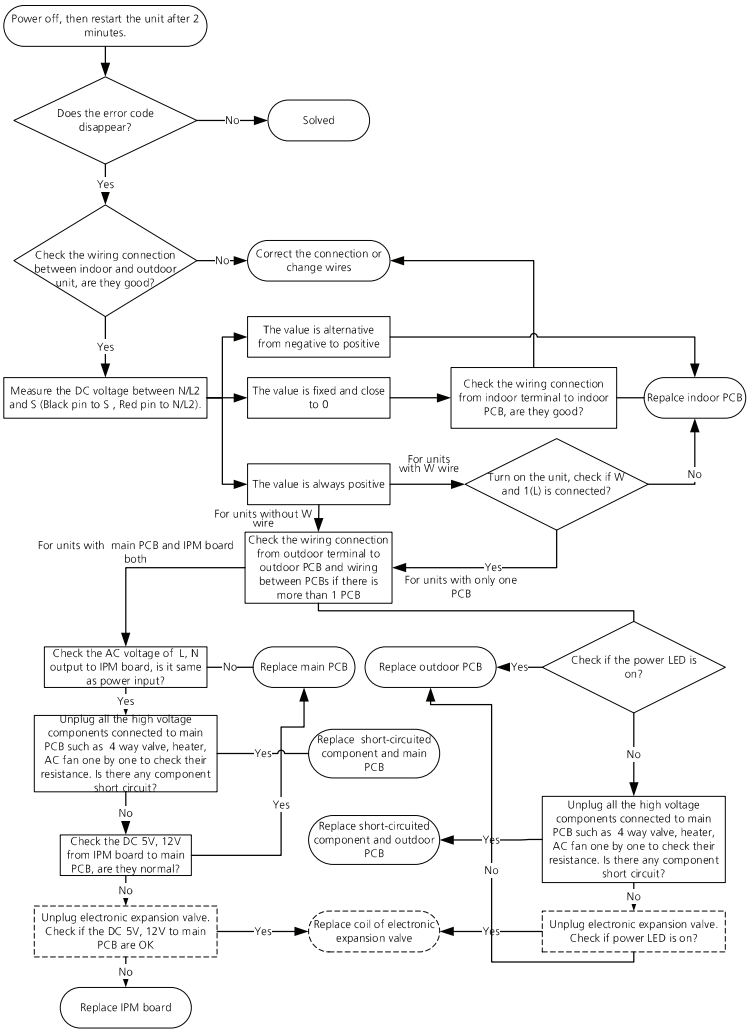
NOTE: *On various models the outdoor PCB can not be removed separately. In this situation the entire outdoor electric control box should be replaced.*

4.3. TS02-S-INV

Description: Indoor unit cannot communicate with the outdoor unit.

Possible Affected Components: Indoor PCB, Outdoor PCB, IPM PCB or short-circuited component.

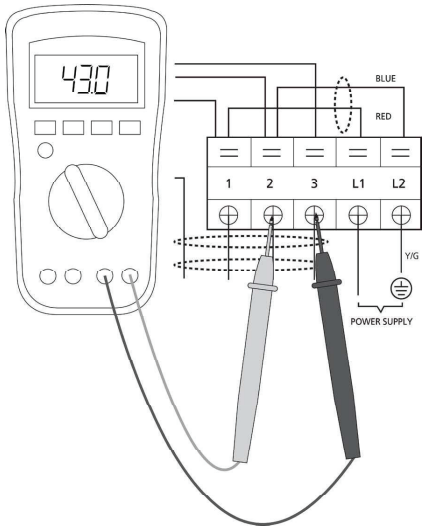
Troubleshooting and Repair:

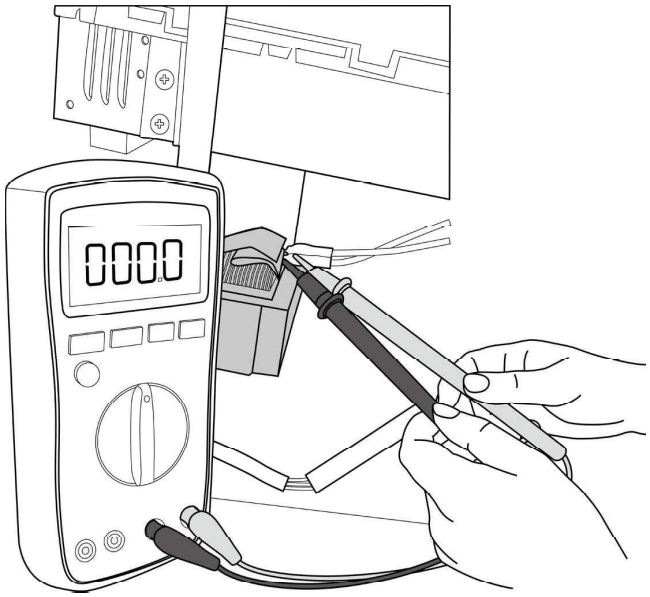


NOTE: *On various models the outdoor PCB can not be removed separately. In this situation the entire outdoor electric control box should be replaced.*

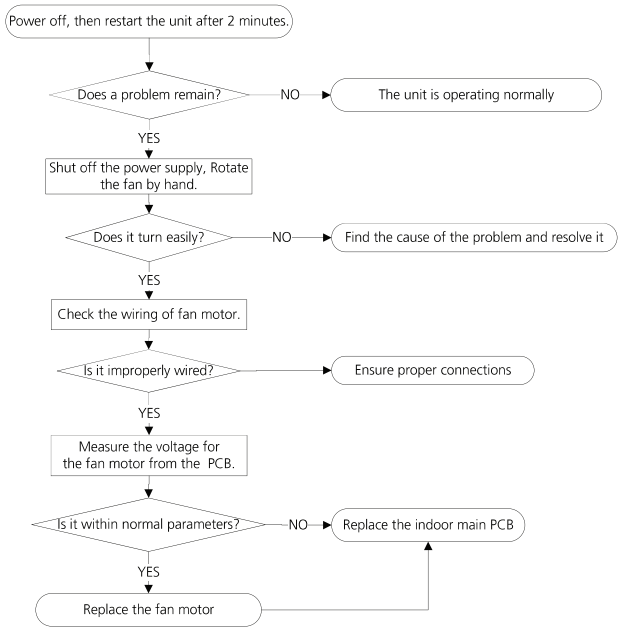
Remarks:

- Use a multimeter to test the DC voltage between two terminals (2 and 3).
- When the system is normally running, the voltage should alternate between -25V to 25V).
- If the outdoor unit has malfunction, the voltage will move alternately with positive values.
- If the indoor unit has malfunction, the voltage will between a certain value.



Description: Indoor unit cannot communicate with the outdoor unit.	
• Use a multimeter to test the resistance of the reactor which does not connect with the capacitor. • The normal value should be zero ohm. Any other reading typically indicates the reactor has malfunction.	

4.4. TS04-S-IDU

Description: When the indoor fan speed is to low or to high undeterminate amount of time, the LED displays the failure code and the system turns off.	
Possible Affected Components: Indoor main PCB, fan motor, fan assembly or connection wires.	
Troubleshooting and Repair:	

Description: When the indoor fan speed is to low or to high undeterminate amount of time, the LED displays the failure code and the system turns off.

1. Indoor DC Fan motor (control chip is integrated with fan motor.

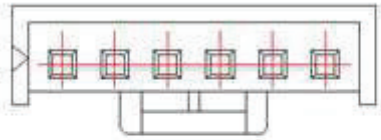
Power up the system and when the unit is in standby mode, measure the voltage of pin 1 - pin 3 and pin 4 - pin 3 on the fan motor connection. If the value of the voltage is not in the range showing in the table below, the PCB must have issues and needs to be replaced.

- DC motor voltage input and output (voltage: 220-240VAC~):

No.	Color	Signal	Voltage
1	Red	Vs/Vm	192V~380V
2	---	---	---
3	Black	GND	0V
4	White	Vcc	14-17.5V
5	Yellow	Vsp	0~5.6V
6	Blue	FG	14-17.5V

- DC motor voltage input and output (voltage: 115V~):

No.	Color	Signal	Voltage
1	Red	Vs/Vm	140V~190V
2	---	---	---
3	Black	GND	0V
4	White	Vcc	14-17.5V
5	Yellow	Vsp	0~5.6V
6	Blue	FG	14-17.5V



Description: When the indoor fan speed is to low or to high undeterminate amount of time, the LED displays the failure code and the system turns off.

2. Indoor unit Fan motor:

a. Power off and disconnect fan motor power cord from the PCB. Measure the resistance value of each winding by using a multimeter. The normal values are show as shown to the right.

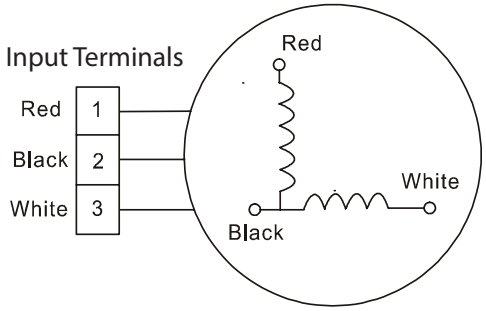
Model	YKFG-13-4-38L YKFG-13-4-38L-4	YKFG-15-4-28-1	YKFG-20-4-10L	YKFG-20-4-5-11
Brand	Welling	Welling	Welling	Welling
Black – Red Main	345Ω	75Ω	269Ω	388Ω
Blue – Black AUX	348Ω	150Ω	224Ω	360Ω

Model	YKFG-20-4-5-19	YKFG-25-4-6-14	YKFG-28-4-3-7 YKFG-28-4-3-14	YKFG-28-4-6-5
Brand	Welling	Welling	Welling	Welling
Black – Red Main	444Ω	287Ω	231Ω	183.6Ω
Blue – Black AUX	470Ω	409Ω	414Ω	206Ω

Model	YKFG-45-4-13	YKFG-45-4-22 YKFG-45-4-22-13	YKFG-60-4-2-6	YKFG-60-4-1
Brand	Dongfang	Welling	Welling	Welling
Black – Red Main	125.2Ω	168Ω	96Ω	68Ω
Blue – Black AUX	83.8Ω	141Ω	96Ω	53Ω

Model	YKFG-20-4-5-21
Brand	Welling
Black – Red Main	450Ω
Blue – Black AUX	442Ω

b. Power on the system and set the unit running in fan mode at the highest fan speed. After running for 15 seconds measure the voltage of pin 1 and pin 2. If the value of the voltage is less than 100V (208~240V power supply) or 50V (115V power supply)the indoor control PCB has an issues and will need to be replaced.

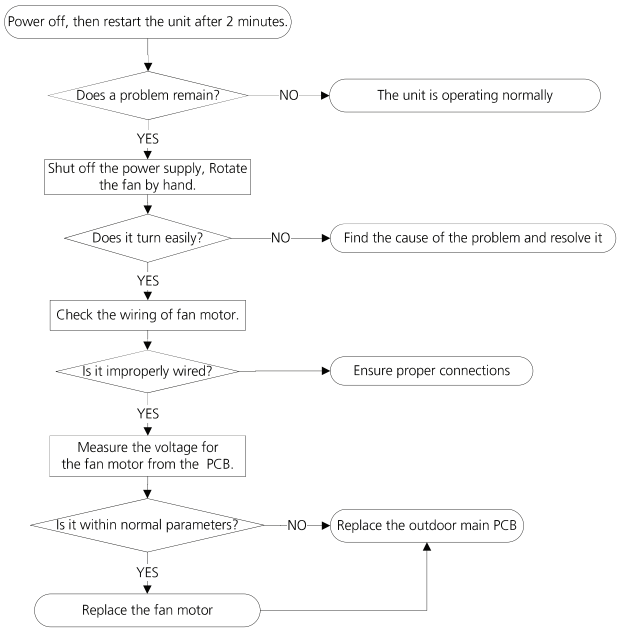


4.5. TS04-S-ODU

Description: When the outdoor fan speed is to low or to high undeterminate amount of time, the LED displays the failure code and the system turns off.

Possible Affected Components: Outdoor main PCB, fan motor, fan assembly or connection wires.

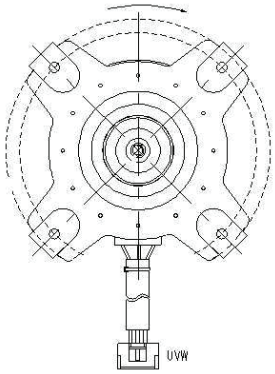
Troubleshooting and Repair:



NOTE: *On various models the outdoor PCB can not be removed separately. In this situation the entire outdoor electric control box should be replaced.*

1. Outdoor DC Fan motor (control chip is integrated with fan motor.

- Release the UVW connector. Measure the resistance of U-V, U-W and V-W. If the resistance is not equal to each other, the fan motor must have an issue and will need to be replaced or the PCB has the issue and it must be replaced.

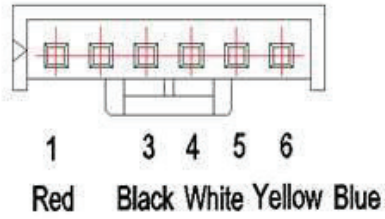


Description: When the outdoor fan speed is to low or to high undeterminate amount of time, the LED displays the failure code and the system turns off.

2. Outdoor DC Fan Motor (control chip is integrated on the PCB:

Power on the system and place the unit in standby mode. Measure the voltage between pin 1 and pin 3, pin 4 and pin 4 on the fan motor connector. If the value of the voltage is not in the range showing in the below table, the outdoor PCB must issues and will need to be replaced.

No.	Color	Signal	Voltage
1	Red	Vs/Vm	192V~380V
2	---	---	---
3	Black	GND	0V
4	White	Vcc	13.5-16.5V
5	Yellow	Vsp	0~6.5V
6	Blue	FG	13.5-16.5V

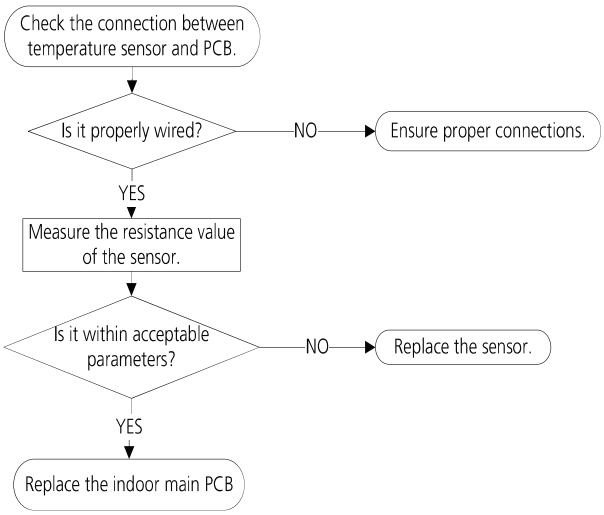


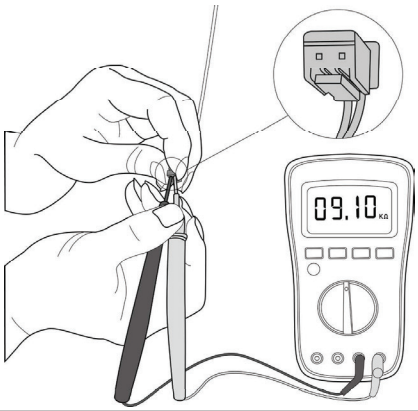
4.6. TS05-IDU

Description: Open circuit or short circuit of indoor temperature sensors (T1 or T2). If the sampling voltage is lower than 0.06V or higher than 4.94V, the LED displays the failure code.

Possible Affected Components: Indoor main PCB, sensors or connection wires.

Troubleshooting and Repair:





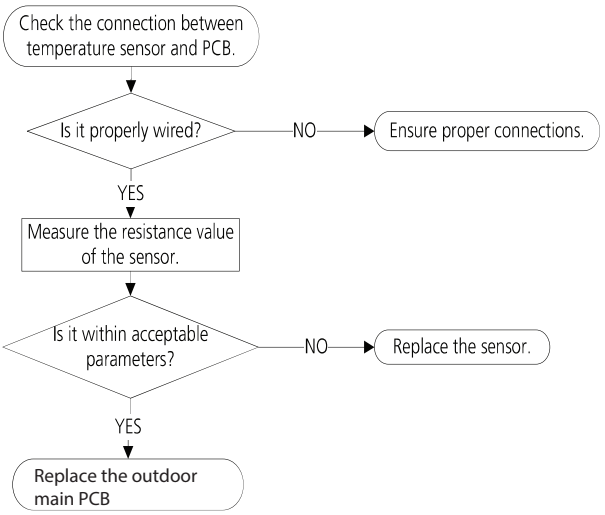
This illustration and the value displayed is only an exampled and actual appearance and value may vary.

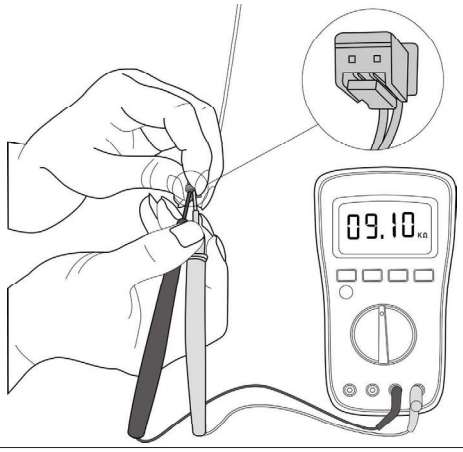
4.7. TS05-ODU

Description: Open circuit or short circuit of indoor temperature sensors (T3, T4 and TP). If the sampling voltage is lower than 0.06V or higher than 4.94V, the LED displays the failure code.

Possible Affected Components: Indoor main PCB, sensors or connection wires.

Troubleshooting and Repair:





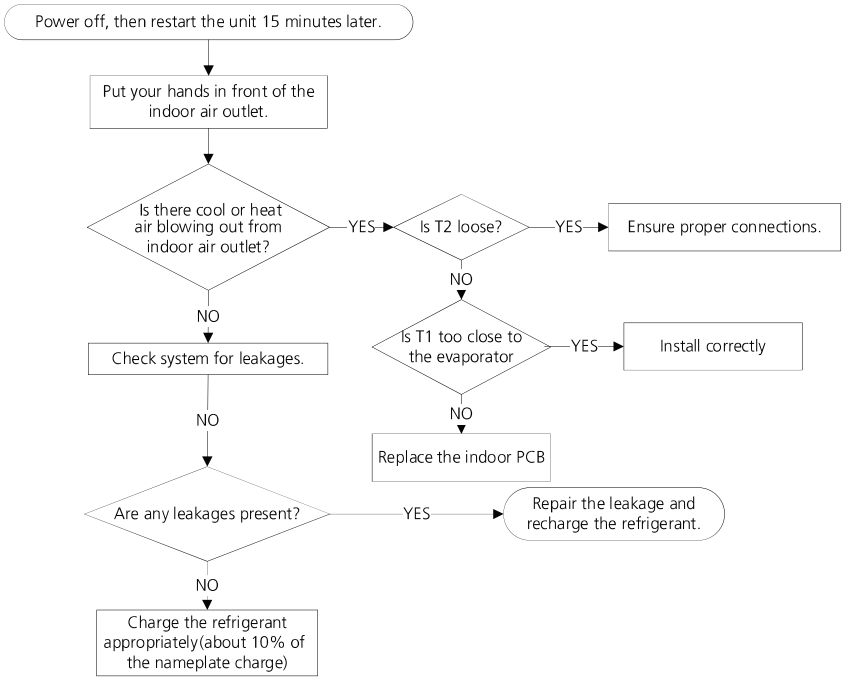
NOTE: *On various models the outdoor PCB can not be removed separately. In this situation the entire outdoor electric control box should be replaced.* This illustration and the value displayed is only an exampled and actual appearance and value may vary.

4.8. TS06-INV

Description: Refrigerant Leakage Detection. Evaluate abnormal operation of the refrigeration system according to the number of compressor stops and the changes in the operating parameters caused by excessive exhaust temperature.

Possible Affected Components: Indoor main PCB or need to add refrigerant.

Troubleshooting and Repair:

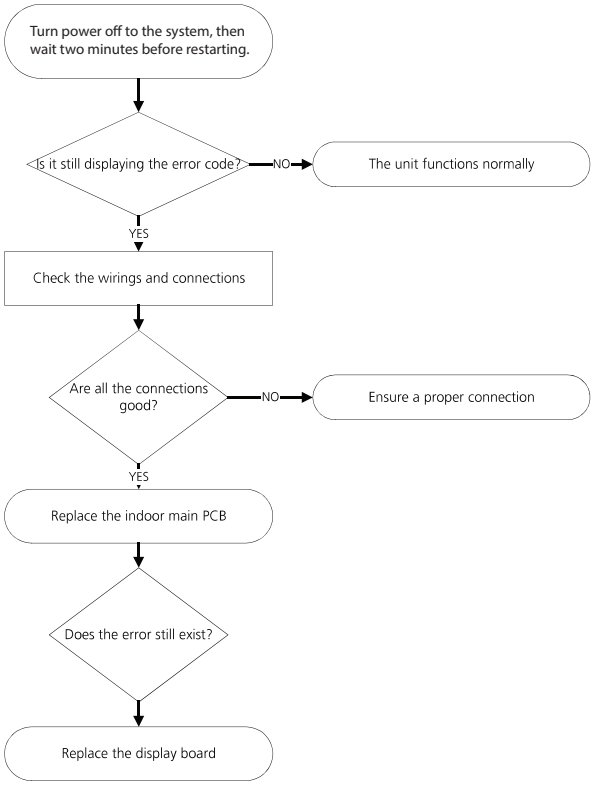


4.9. TS07

Description: Indoor PCB / display board communication error. Indoor PCB does not receive feedback from the display board.

Possible Affected Components: Indoor main PCB,display board or communication wiring.

Troubleshooting and Repair:

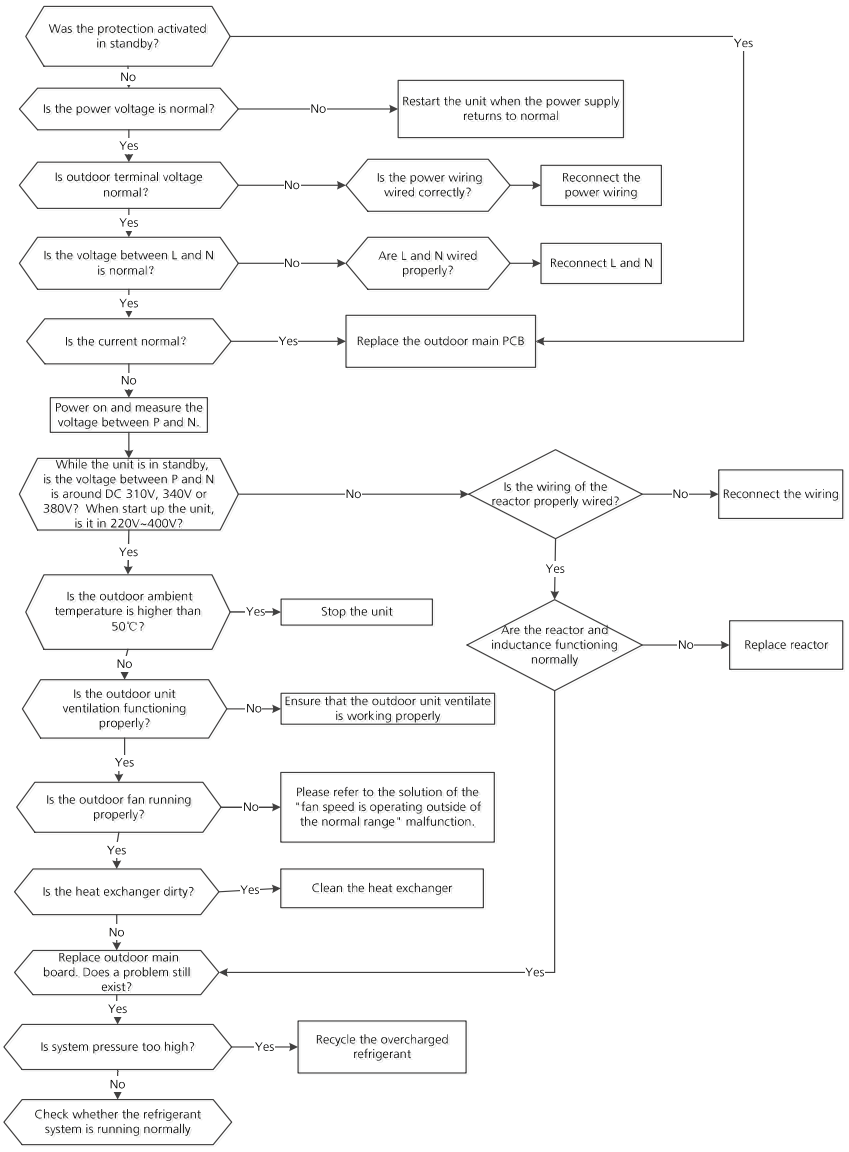


4.10. TS08-S

Description: Current overload protection. An abnormal current rise is detected by checking the specified current detection circuit.

Possible Affected Components: Reactor, outdoor fan, outdoor PCB or communication wiring.

Troubleshooting and Repair:



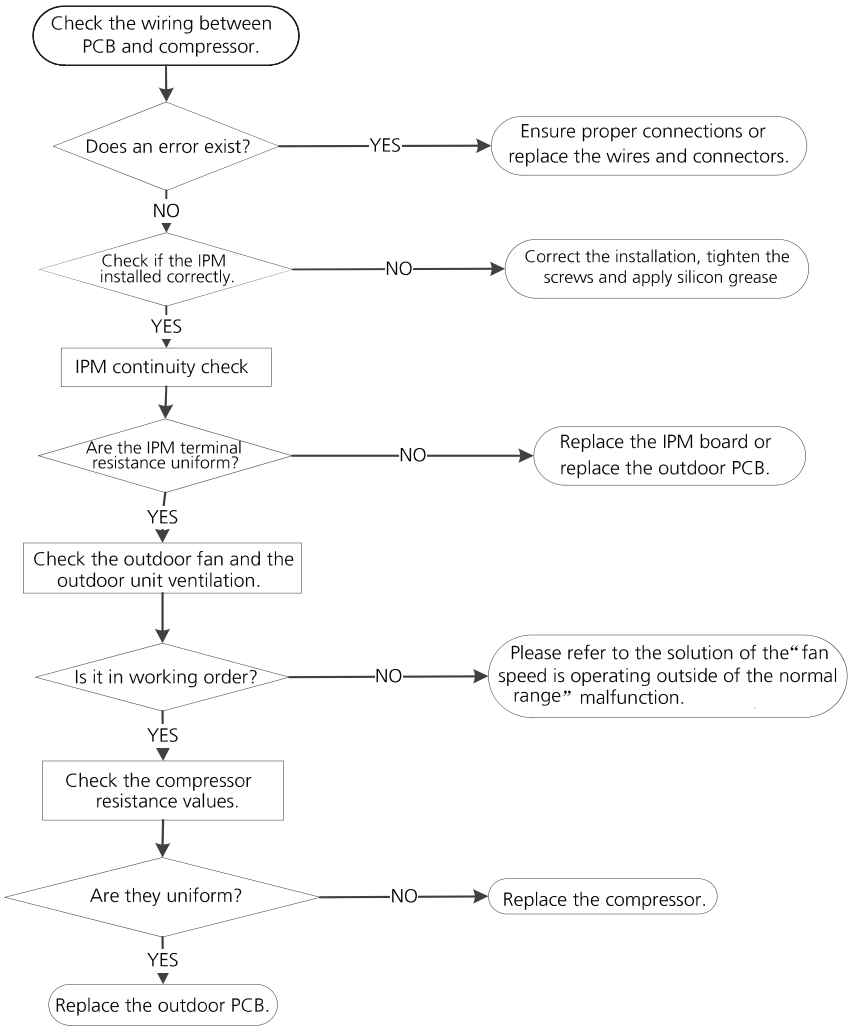
NOTE: *On various models the outdoor PCB can not be removed separately. In this situation the entire outdoor electric control box should be replaced*

4.11. TS09-S

Description: IPM malfunction or IGBT high current protection. When the IPM voltage signal to the compressor drive chip is abnormal, the LED displays the failure code and the system will turn off.

Possible Affected Components: Outdoor PCB, compressor, outdoor fan assembly, IPM module board or connection wires.

Troubleshooting and Repair:



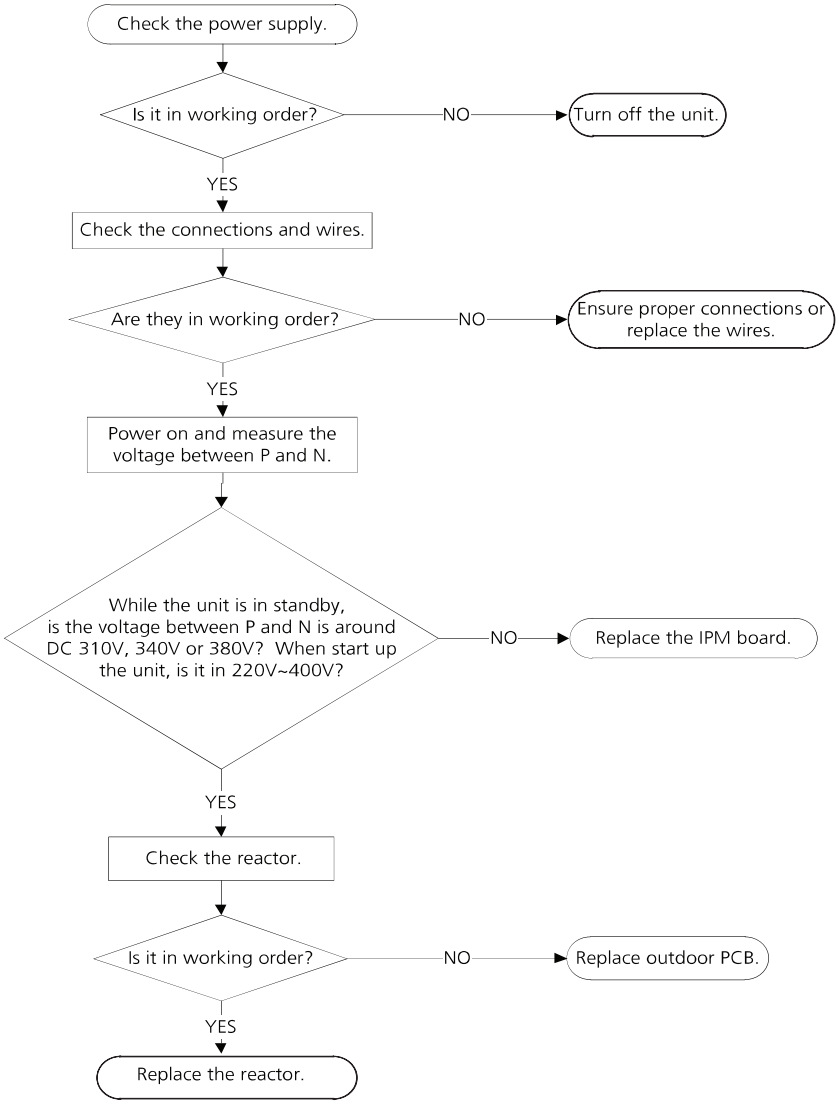
NOTE: *On various models the outdoor PCB can not be removed separately. In this situation the entire outdoor electric control box should be replaced*

4.12. TS10-S

Description: High or low voltage protection. Abnormal increases or decreases in voltage are detected by checking the specified voltage detection circuit.

Possible Affected Components: Power supply wiring, IPM module board, Outdoor PCB or reactor.

Troubleshooting and Repair:



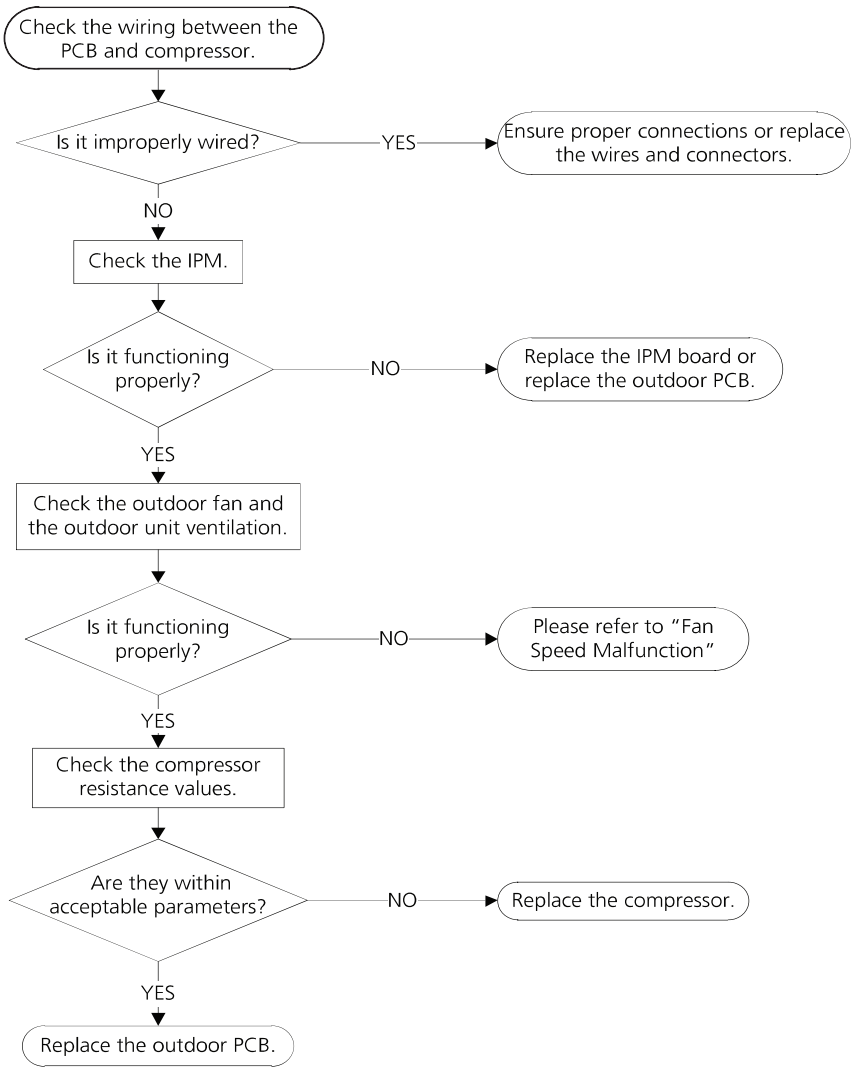
NOTE: *On various models the outdoor PCB can not be removed separately. In this situation the entire outdoor electric control box should be replaced*

4.13. TS12-S

Description: Inverter compressor drive error. An abnormal inverter compressor drive is detected by a special detection circuit that includes communication signal detection, voltage detection and compressor rotation speed signal detection.

Possible Affected Components: Connection wires, IPM module board, outdoor fan assembly, compressor or outdoor PCB.

Troubleshooting and Repair:



NOTE: *On various models the outdoor PCB can not be removed separately. In this situation the entire outdoor electric control box should be replaced*

5. Check Procedures

5.1. Temperature Sensor Check

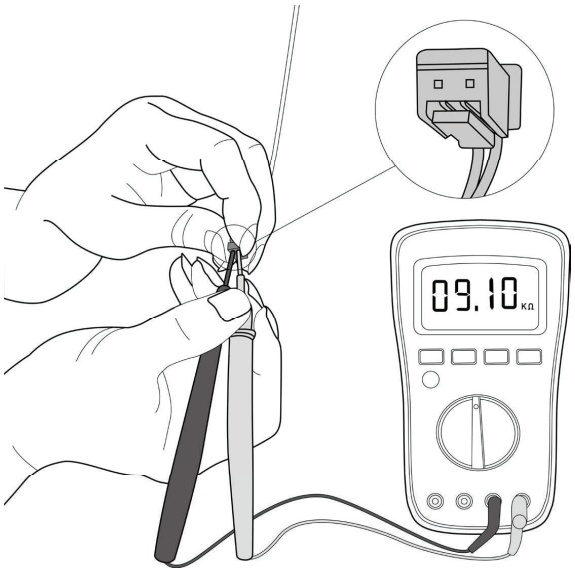
⚠WARNING

Verify that power supplies have been disconnected to avoid electrick shock. Operate the system after restoring power and the compressor and coil have had time to returned to normal operating temperature.

a. Disconnect the temperature sensor from the PCB (see Appendix D - Indoor/Outdoor Unit Disassembly).

b. Measure the resistance value of the sensor using a multimeter.

c. Check corresponding temperature sensor resistance value tables (see Appendix A - Temperature Resistance Values).



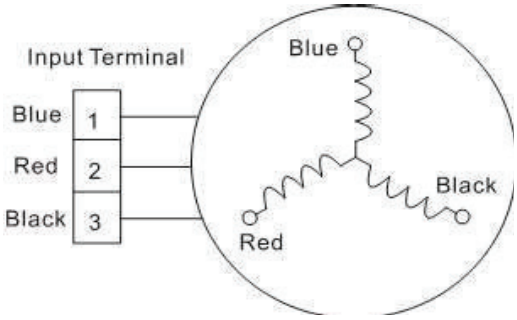
Note: The picture and the value are only for reference, actual condition and specific value may vary.

5.2. Compressor Check

a. Disconnect the compressor power cord from the outdoor PCB (see Appendix D - Indoor/Outdoor Unit Disassembly).

b. Measure the resistance value of each winding using a multimeter.

c. Check the resistance value of each winding in the following tables.



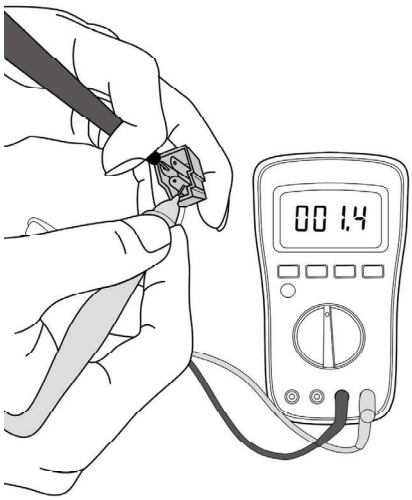
Resistance Value	ASM135D23UFZ	ATQ420D1UMU	ASN98D22UFZ	ATF235D22UMT	ATQ360D1UMU
Blue-Red	1.75Ω	0.37Ω	1.57Ω	0.75Ω	0.37Ω
Blue-Black					
Red-Black					

Resistance Value	ATM115D43UFZ2	ATF250D22UMT	ATF310D43UMT	KSK103D33UEZ3(YJ)	ASM98D32UFZ
Blue-Red	1.87Ω	0.75Ω	0.65Ω	2.13Ω	2.2Ω
Blue-Black					
Red-Black					

Resistance Value	ASN140D21UFZ	ASK89D29UEZD	KSN140D21UFZ	KTM240D57UMT	KSK103D33UEZ3
Blue-Red	1.28Ω	1.99Ω	1.28Ω	0.62Ω	2.13Ω
Blue-Black					
Red-Black					

Resistance Value	KTF310D43UMT	KTQ420D1UMU	ATN150D30UFZA	KTM240D43UKT	KTN110D42UFZ
Blue-Red	0.65Ω	0.37Ω	1.03Ω	1.03Ω	1.82Ω
Blue-Black					
Red-Black					

Resistance Value	KTF250D22UMT	KSN140D58UFZ
Blue-Red	0.75Ω	1.86Ω
Blue-Black		
Red-Black		



Note: The picture and the value are only for reference, actual condition and specific value may vary.

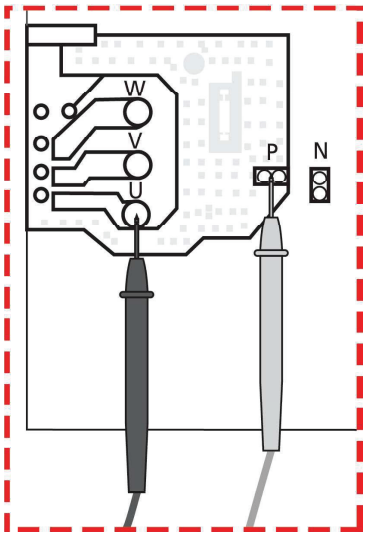
5.3. IPM Continuity Check

WARNING

Verify that capacitors are fully discharged before troubleshooting.

a. Turn off outdoor unit and disconnect power supply
a. Discharge capacitors.
a. Disassemble outdoor PCB or IPM board.
a. Measure the resistance value between P and U, (U, W, N); U (U, W) and N.

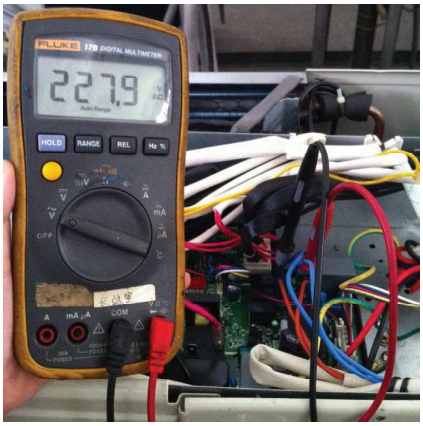
Digital tester		Resistance value	Digital tester		Resistance value
(+)Red	(-)Black		(+)Red	(-)Black	
P	N	∞ (Several MΩ)	U	N	∞ (Several MΩ)
	U		V		
	V		W		
	W		-		



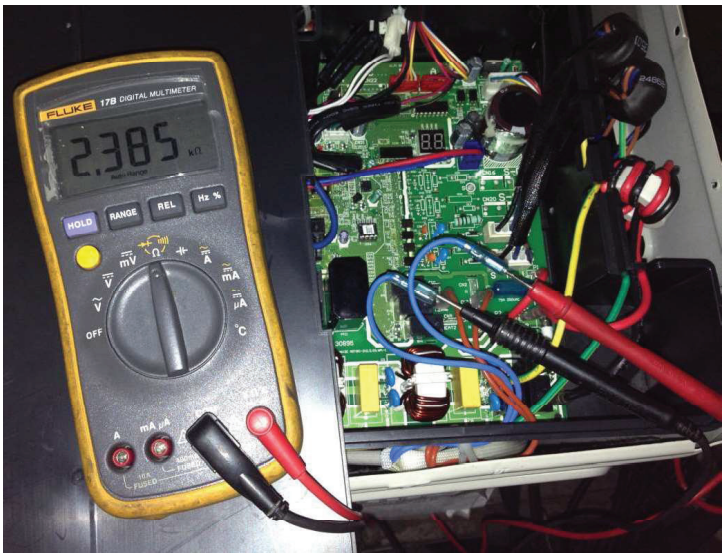
Note: The picture and the value are only for reference, actual condition and specific value may vary.

5.4. Reversing Valve Check

a. Power on the system and use a digital tester to measure the voltage when the system is operating in cooling mode and the reading should be 0VAC. When the system is operating in heating mode, the value should be 230VAC. If the voltage value is not in the specified ranges, the PCB will be the issue and will need to be replace.



Turn off the system power use a digital tester to measure the resistance. The resistance value should be 1.8~2.5 Ω.



6. Temperature Sensor Resistance Values

6.1. Temperature Sensor Resistance Values

Table 6. Temperature Sensor Resistance Value Table for T1,T2,T3 and T4 (°C – K)

°F	°C	K Ohm	°F	°C	K Ohm	°F	°C	K Ohm	°F	°C	K Ohm
-4	-20	115.266	68	20	12.6431	140	60	2.35774	212	100	0.62973
-2.2	-19	108.146	69.8	21	12.0561	141.8	61	2.27249	213.8	101	0.61148
-0.4	-18	101.517	71.6	22	11.5	143.6	62	2.19073	215.6	102	0.59386
1.4	-17	96.3423	73.4	23	10.9731	145.4	63	2.11241	217.4	103	0.57683
3.2	-16	89.5865	75.2	24	10.4736	147.2	64	2.03732	219.2	104	0.56038
5	-15	84.219	77	25	10	149	65	1.96532	221	105	0.54448
6.8	-14	79.311	78.8	26	9.55074	150.8	66	1.89627	222.8	106	0.52912
8.6	-13	74.536	80.6	27	9.12445	152.6	67	1.83003	224.6	107	0.51426
10.4	-12	70.1698	82.4	28	8.71983	154.4	68	1.76647	226.4	108	0.49989
12.2	-11	66.0898	84.2	29	8.33566	156.2	69	1.70547	228.2	109	0.486
14	-10	62.2756	86	30	7.97078	158	70	1.64691	230	110	0.47256
15.8	-9	58.7079	87.8	31	7.62411	159.8	71	1.59068	231.8	111	0.45957
17.6	-8	56.3694	89.6	32	7.29464	161.6	72	1.53668	233.6	112	0.44699
19.4	-7	52.2438	91.4	33	6.98142	163.4	73	1.48481	235.4	113	0.43482
21.2	-6	49.3161	93.2	34	6.68355	165.2	74	1.43498	237.2	114	0.42304
23	-5	46.5725	95	35	6.40021	167	75	1.38703	239	115	0.41164
24.8	-4	44	96.8	36	6.13059	168.8	76	1.34105	240.8	116	0.4006
26.6	-3	41.5878	98.6	37	5.87359	170.6	77	1.29078	242.6	117	0.38991
28.4	-2	39.8239	100.4	38	5.62961	172.4	78	1.25423	244.4	118	0.37956
30.2	-1	37.1988	102.2	39	5.39689	174.2	79	1.2133	246.2	119	0.36954
32	0	35.2024	104	40	5.17519	176	80	1.17393	248	120	0.35982
33.8	1	33.3269	105.8	41	4.96392	177.8	81	1.13604	249.8	121	0.35042
35.6	2	31.5635	107.6	42	4.76253	179.6	82	1.09958	251.6	122	0.3413
37.4	3	29.9058	109.4	43	4.5705	181.4	83	1.06448	253.4	123	0.33246
39.2	4	28.3459	111.2	44	4.38736	183.2	84	1.03069	255.2	124	0.3239
41	5	26.8778	113	45	4.21263	185	85	0.99815	257	125	0.31559
42.8	6	25.4954	114.8	46	4.04589	186.8	86	0.96681	258.8	126	0.30754
44.6	7	24.1932	116.6	47	3.88673	188.6	87	0.93662	260.6	127	0.29974
46.4	8	22.5662	118.4	48	3.73476	190.4	88	0.90753	262.4	128	0.29216
48.2	9	21.8094	120.2	49	3.58962	192.2	89	0.8795	264.2	129	0.28482
50	10	20.7184	122	50	3.45097	194	90	0.85248	266	130	0.2777
51.8	11	19.6891	123.8	51	3.31847	195.8	91	0.82643	267.8	131	0.27078
53.6	12	18.7177	125.6	52	3.19183	197.6	92	0.80132	269.6	132	0.26408
55.4	13	17.8005	127.4	53	3.07075	199.4	93	0.77709	271.4	133	0.25757
57.2	14	16.9341	129.2	54	2.95896	201.2	94	0.75373	273.2	134	0.25125
59	15	16.1156	131	55	2.84421	203	95	0.73119	275	135	0.24512
60.8	16	15.3418	132.8	56	2.73823	204.8	96	0.70944	276.8	136	0.23916
62.6	17	14.6181	134.6	57	2.63682	206.6	97	0.68844	278.6	137	0.23338
64.4	18	13.918	136.4	58	2.53973	208.4	98	0.66818	280.4	138	0.22776
66.2	19	13.2631	138.2	59	2.44677	210.2	99	0.64862	282.2	139	0.22231

6.2. Discharge Temperature Sensor Resistance Values

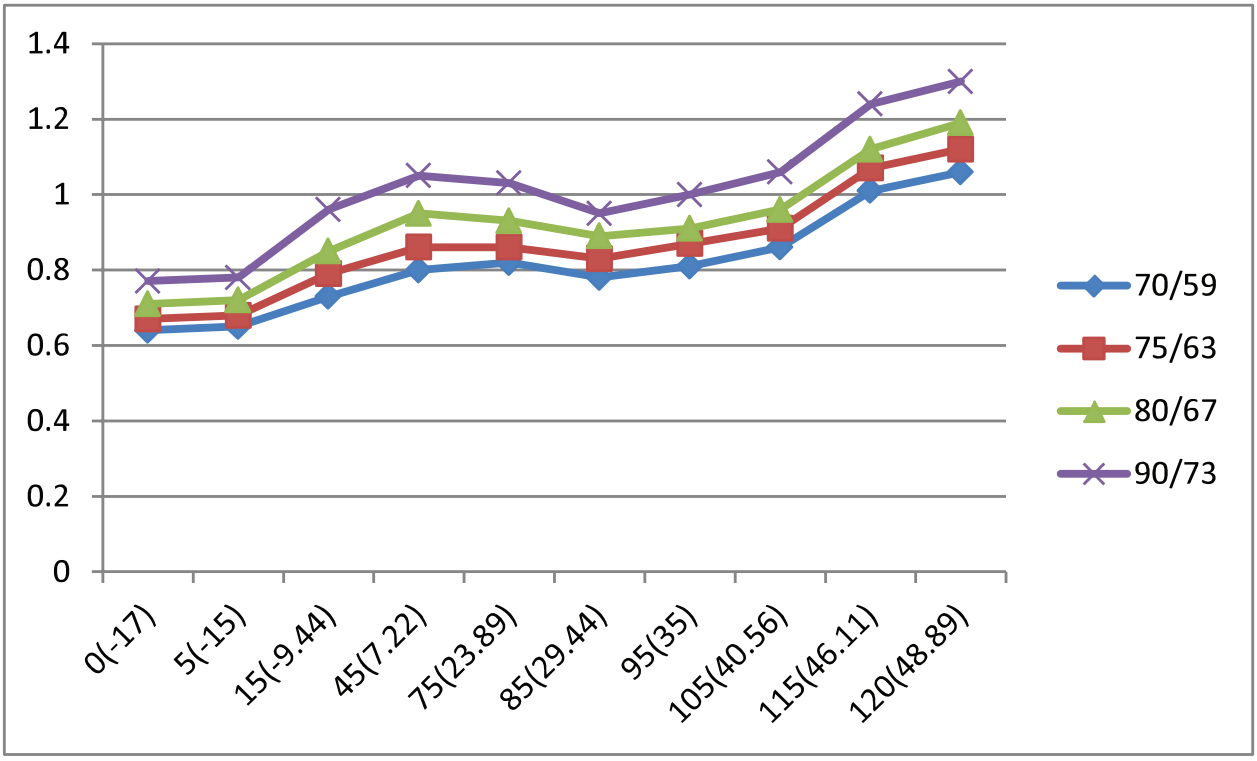
Table 7. Temperature Sensor Resistance Value Table for TP (°C – K)

°F	°C	K Ohm	°F	°C	K Ohm	°F	°C	K Ohm	°F	°C	K Ohm
-4	-20	542.7	68	20	68.66	140	60	13.59	212	100	3.702
-2.2	-19	511.9	69.8	21	65.62	141.8	61	13.11	213.8	101	3.595
-0.4	-18	455.9	71.6	22	59.98	143.6	62	12.21	215.6	102	3.392
1.4	-17	455.9	73.4	23	59.98	145.4	63	12.21	217.4	103	3.392
3.2	-16	430.5	75.2	24	57.37	147.2	64	11.79	219.2	104	3.296
5	-15	406.7	77	25	54.89	149	65	11.38	221	105	3.203
6.8	-14	384.3	78.8	26	52.53	150.8	66	10.99	222.8	106	3.113
8.6	-13	363.3	80.6	27	50.28	152.6	67	10.61	224.6	107	3.025
10.4	-12	343.6	82.4	28	48.14	154.4	68	10.25	226.4	108	2.941
12.2	-11	325.1	84.2	29	46.11	156.2	69	9.902	228.2	109	2.86
14	-10	307.7	86	30	44.17	158	70	9.569	230	110	2.781
15.8	-9	291.3	87.8	31	42.33	159.8	71	9.248	231.8	111	2.704
17.6	-8	275.9	89.6	32	40.57	161.6	72	8.94	233.6	112	2.63
19.4	-7	261.4	91.4	33	38.89	163.4	73	8.643	235.4	113	2.559
21.2	-6	247.8	93.2	34	37.3	165.2	74	8.358	237.2	114	2.489
23	-5	234.9	95	35	35.78	167	75	8.084	239	115	2.422
24.8	-4	222.8	96.8	36	34.32	168.8	76	7.82	240.8	116	2.357
26.6	-3	211.4	98.6	37	32.94	170.6	77	7.566	242.6	117	2.294
28.4	-2	200.7	100.4	38	31.62	172.4	78	7.321	244.4	118	2.233
30.2	-1	190.5	102.2	39	30.36	174.2	79	7.086	246.2	119	2.174
32	0	180.9	104	40	29.15	176	80	6.859	248	120	2.117
33.8	1	171.9	105.8	41	28	177.8	81	6.641	249.8	121	2.061
35.6	2	163.3	107.6	42	26.9	179.6	82	6.43	251.6	122	2.007
37.4	3	155.2	109.4	43	25.86	181.4	83	6.228	253.4	123	1.955
39.2	4	147.6	111.2	44	24.85	183.2	84	6.033	255.2	124	1.905
41	5	140.4	113	45	23.89	185	85	5.844	257	125	1.856
42.8	6	133.5	114.8	46	22.89	186.8	86	5.663	258.8	126	1.808
44.6	7	127.1	116.6	47	22.1	188.6	87	5.488	260.6	127	1.762
46.4	8	121	118.4	48	21.26	190.4	88	5.32	262.4	128	1.717
48.2	9	115.2	120.2	49	20.46	192.2	89	5.157	264.2	129	1.674
50	10	109.8	122	50	19.69	194	90	5	266	130	1.632
51.8	11	104.6	123.8	51	18.96	195.8	91	4.849			
53.6	12	99.69	125.6	52	18.26	197.6	92	4.703			
55.4	13	95.05	127.4	53	17.58	199.4	93	4.562			
57.2	14	90.66	129.2	54	16.94	201.2	94	4.426			
59	15	86.49	131	55	16.32	203	95	4.294		B(25/50)=3950K	
60.8	16	82.54	132.8	56	15.73	204.8	96	4.167			
62.6	17	78.79	134.6	57	15.16	206.6	97	4.045		R(90°C)=5KΩ±3%	
64.4	18	75.24	136.4	58	14.62	208.4	98	3.927			
66.2	19	71.86	138.2	59		210.2	99	3.812			

7. Pressure on Service Port

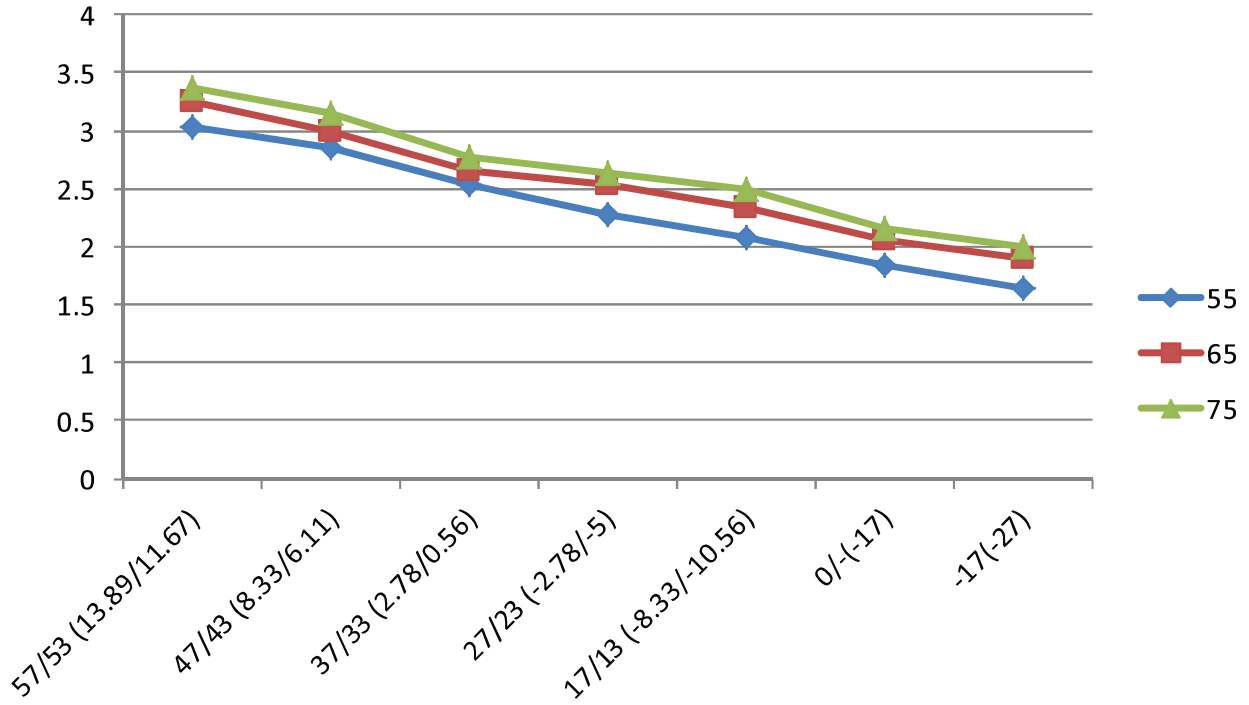
7.1. Cooling Chart (R-410A)

°F(°C)	ODU(DB) / IDU(DB/WB)	0(-17)	5(-15)	15 (-9.44)	45 (7.22)	75 (23.89)	85 (29.44)	95 (35)	105 (40.56)	115 (46.11)	120 (48.89)
BAR	70/59 (21.11/15)	6.4	6.5	7.3	8.0	8.2	7.8	8.1	8.6	10.1	10.6
	75/63 (23.89/17.22)	6.7	6.8	7.9	8.6	8.6	8.3	8.7	9.1	10.7	11.2
	80/67 (26.67/19.44)	7.1	7.2	8.5	9.5	9.3	8.9	9.1	9.6	11.2	11.9
	90/73 (32.22/22.78)	7.7	7.8	9.6	10.5	10.3	9.5	10.0	10.6	12.4	13.0
PSI	70/59 (21.11/15)	93	94	106	116	119	113	117	125	147	154
	75/63 (23.89/17.22)	97	99	115	125	124	120	126	132	155	162
	80/67 (26.67/19.44)	103	104	123	138	135	129	132	140	162	173
	90/73 (32.22/22.78)	112	113	139	152	149	138	145	154	180	189
MPa	70/59 (21.11/15)	0.64	0.65	0.73	0.8	0.82	0.78	0.81	0.86	1.01	1.06
	75/63 (23.89/17.22)	0.67	0.68	0.79	0.86	0.86	0.83	0.87	0.91	1.07	1.12
	80/67 (26.67/19.44)	0.71	0.72	0.85	0.95	0.93	0.89	0.91	0.96	1.12	1.19
	90/73 (32.22/22.78)	0.77	0.78	0.96	1.05	1.03	0.95	1	1.06	1.24	1.3



7.2. Heating Chart (R-410A)

°F(°C)	ODU(DB/WB) / IDU(DB)	57/53 (13.89/11.67)	47/43 (8.33/6.11)	37/33 (2.78/0.56)	27/23 (-2.78/-5)	17/13 (-8.33/-10.56)	0/-2 (-17/-19)	-17/-18 (-27/-28)
BAR	55(12.78)	30.3	28.5	25.3	22.8	20.8	18.5	16.5
	65(18.33)	32.5	30.0	26.6	25.4	23.3	20.5	19.0
	75(23.89)	33.8	31.5	27.8	26.3	24.9	21.5	20.0
PSI	55(12.78)	439	413	367	330	302	268	239
	65(18.33)	471	435	386	368	339	297	276
	75(23.89)	489	457	403	381	362	312	290
MPa	55(12.78)	3.03	2.85	2.53	2.28	2.08	1.85	1.65
	65(18.33)	3.25	3.00	2.66	2.54	2.33	2.05	1.90
	75(23.89)	3.38	3.15	2.78	2.63	2.49	2.15	2.00



7.3. R-410 System Pressure

Pressure			Temperature		Pressure			Temperature	
Kpa	bar	PSI	°C	°F	Kpa	bar	PSI	°C	°F
100	1	14.5	-51.623	-60.921	2350	23.5	340.75	38.817	101.871
150	1.5	21.75	-43.327	-45.989	2400	24	348	39.68	103.424
200	2	29	-36.992	-34.586	2450	24.5	355.25	40.531	104.956
250	2.5	36.25	-31.795	-25.231	2500	25	362.5	41.368	106.462
300	3	43.5	-27.351	-17.232	2550	25.5	369.75	42.192	107.946
350	3.5	50.75	-23.448	-10.206	2600	26	377	43.004	109.407
400	4	58	-19.953	-3.915	2650	26.5	384.25	43.804	110.847
450	4.5	65.25	-16.779	1.798	2700	27	391.5	44.592	112.266
500	5	72.5	-13.863	7.047	2750	27.5	398.75	45.37	113.666
550	5.5	79.75	-11.162	11.908	2800	28	406	46.136	115.045
600	6	87	-8.643	16.444	2850	28.5	413.25	46.892	116.406
650	6.5	94.25	-6.277	20.701	2900	29	420.5	47.638	117.748
700	7	101.5	-4.046	24.716	2950	29.5	427.75	48.374	119.073
750	7.5	108.75	-1.933	28.521	3000	30	435	49.101	120.382
800	8	116	0.076	32.137	3050	30.5	442.25	49.818	121.672
850	8.5	123.25	1.993	35.587	3100	31	449.5	50.525	122.945
900	9	130.5	3.826	38.888	3150	31.5	456.75	51.224	124.203
950	9.5	137.75	5.584	42.052	3200	32	464	51.914	125.445
1000	10	145	7.274	45.093	3250	32.5	471.25	52.596	126.673
1050	10.5	152.25	8.901	48.022	3300	33	478.5	53.27	127.886
1100	11	159.5	10.471	50.848	3350	33.5	485.75	53.935	129.083
1150	11.5	166.75	11.988	53.578	3400	34	493	54.593	130.267
1200	12	174	13.457	56.223	3450	34.5	500.25	55.243	131.437
1250	12.5	181.25	14.879	58.782	3500	35	507.5	55.885	132.593
1300	13	188.5	16.26	61.268	3550	35.5	514.75	56.52	133.736
1350	13.5	195.75	17.602	63.684	3600	36	522	57.148	134.866
1400	14	203	18.906	66.031	3650	36.5	529.25	57.769	135.984
1450	14.5	210.25	20.176	68.317	3700	37	536.5	58.383	137.089
1500	15	217.5	21.414	70.545	3750	37.5	543.75	58.99	138.182
1550	15.5	224.75	22.621	72.718	3800	38	551	59.591	139.264
1600	16	232	23.799	74.838	3850	38.5	558.25	60.185	140.333
1650	16.5	239.25	24.949	76.908	3900	39	565.5	60.773	141.391
1700	17	246.5	26.074	78.933	3950	39.5	572.75	61.355	142.439
1750	17.5	253.75	27.174	80.913	4000	40	580	61.93	143.474
1800	18	261	28.251	82.852	4050	40.5	587.25	62.499	144.498
1850	18.5	268.25	29.305	84.749	4100	41	594.5	63.063	145.513
1900	19	275.5	30.338	86.608	4150	41.5	601.75	63.62	146.516
1950	19.5	282.75	31.351	88.432	4200	42	609	64.172	147.510
2000	20	290	32.344	90.219	4250	42.5	616.25	64.719	148.494
2050	20.5	297.25	33.319	91.974	4300	43	623.5	65.259	149.466
2100	21	304.5	34.276	93.697	4350	43.5	630.75	65.795	150.431
2150	21.5	311.75	35.215	95.387	4400	44	638	66.324	151.383
2200	22	319	36.139	97.050	4450	44.5	645.25	66.849	152.328
2250	22.5	326.25	37.047	98.685	4500	45	652.5	67.368	153.262
2300	23	333.5	37.939	100.290					

8. Wiring Diagrams

8.1. MWCB Indoor Units

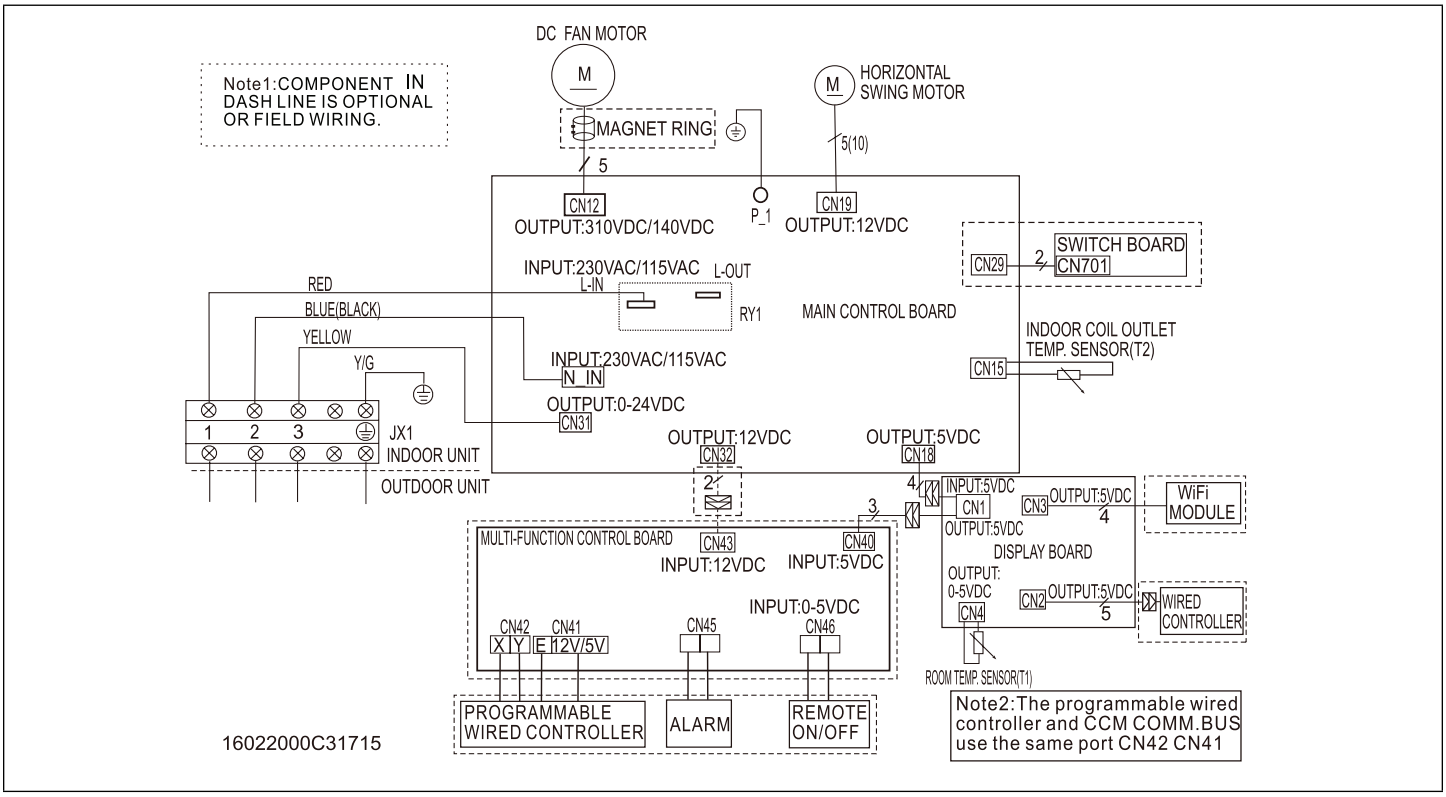


Figure 1. MWCB 09K,12K and 18K Indoor Unit Wiring Diagram (115 and 208/230VAC)

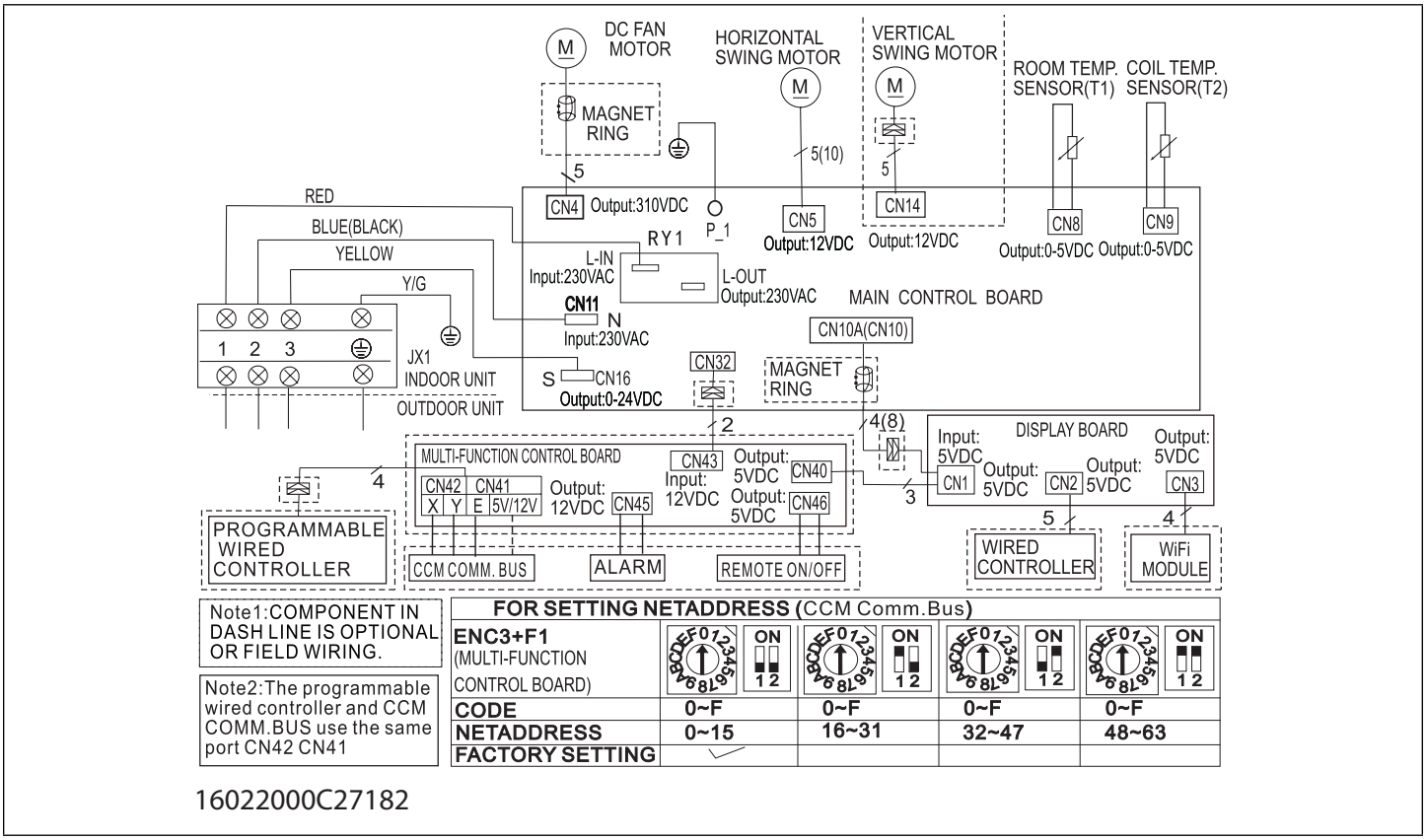


Figure 2. MWCB 24K - 208/230VAC Indoor Unit Wiring Diagram

8.2. MCB Outdoor Units

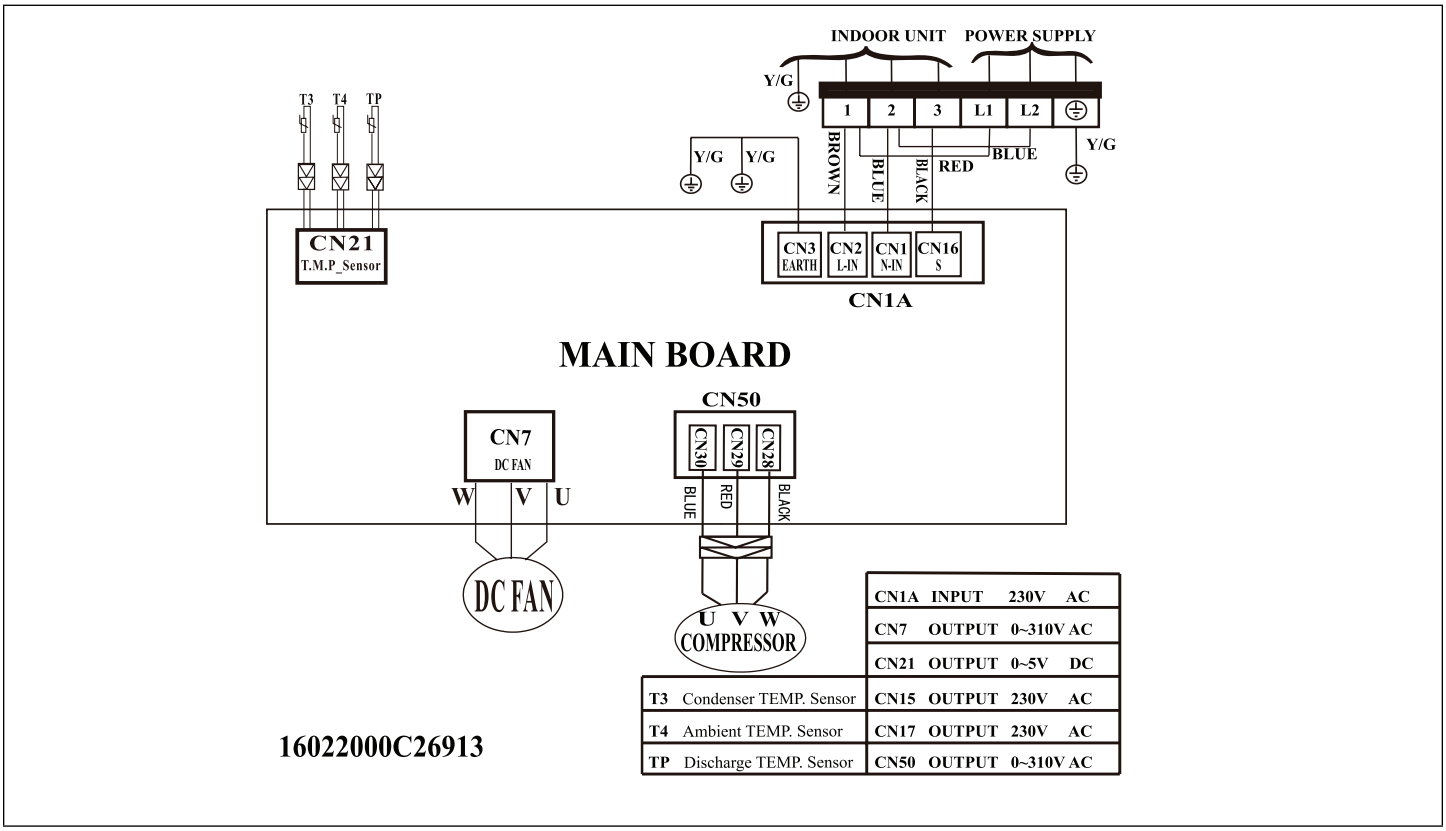


Figure 3. MCB 09, 12K and 18K - 208/230VAC Outdoor Unit Wiring Diagram

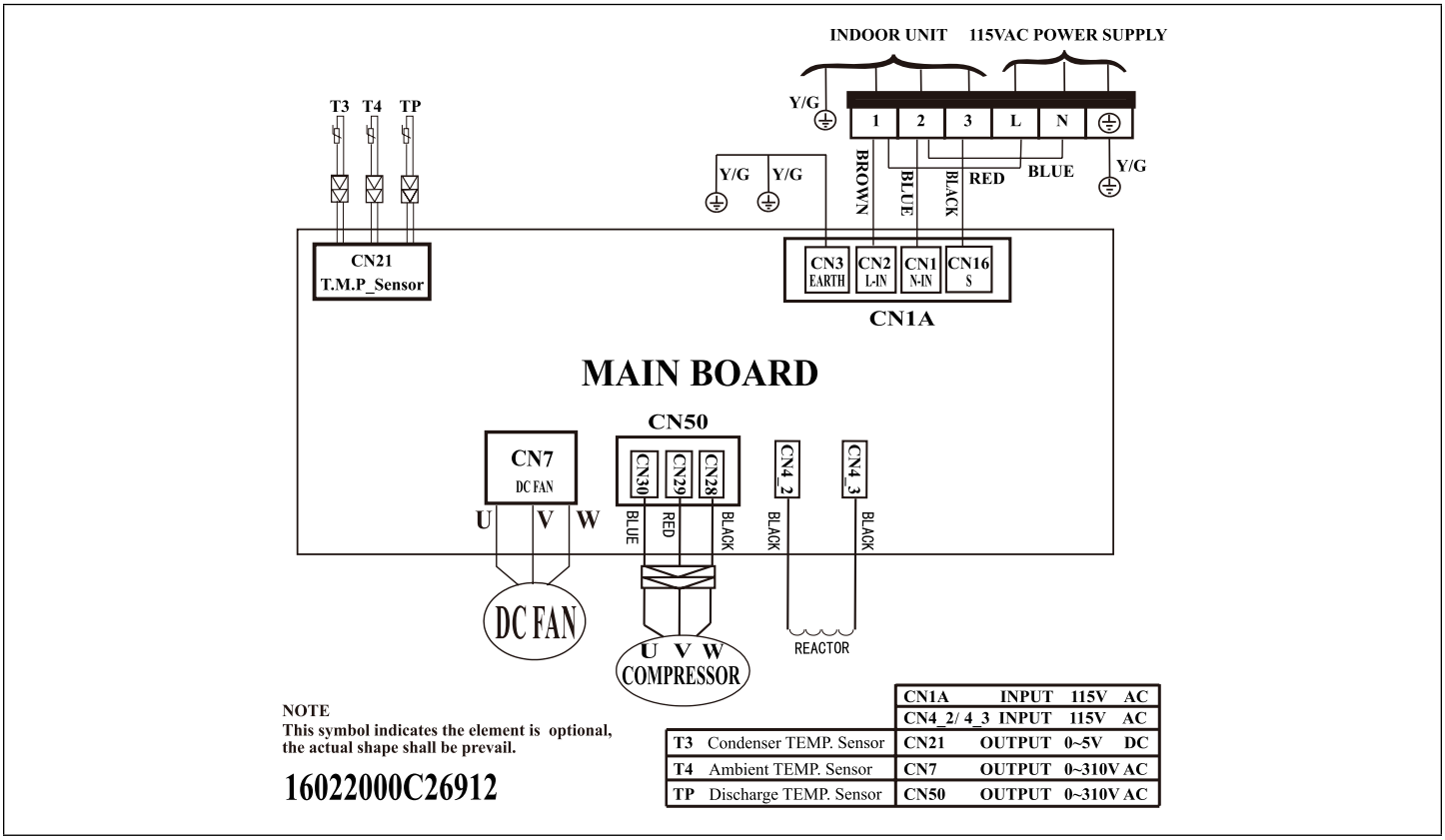


Figure 4. MCB 12K - 115VAC Outdoor Unit Wiring Diagram

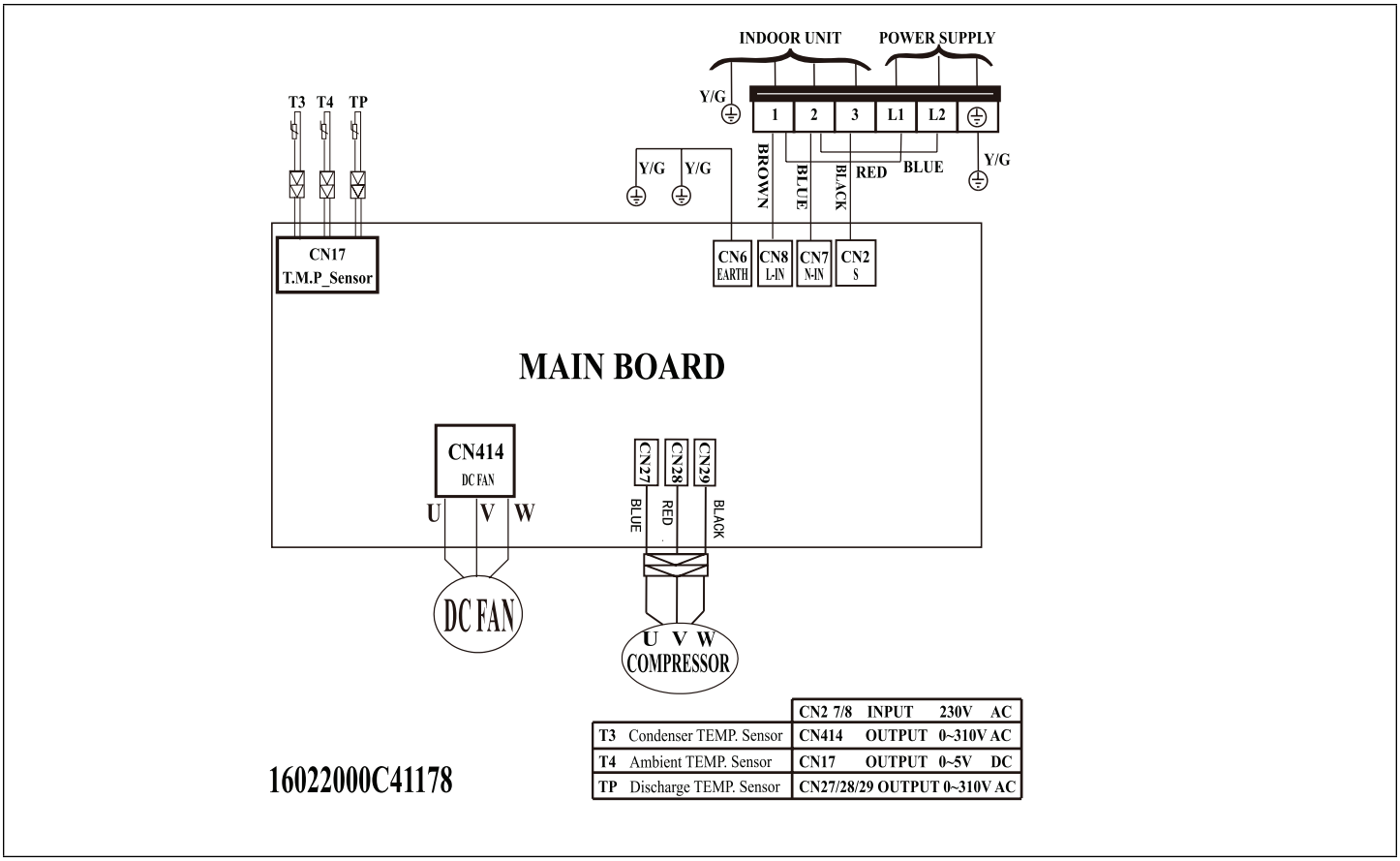


Figure 5. MCB 24K 208/230VAC Outdoor Unit Wiring Diagram

8.3. MWHB Indoor Units

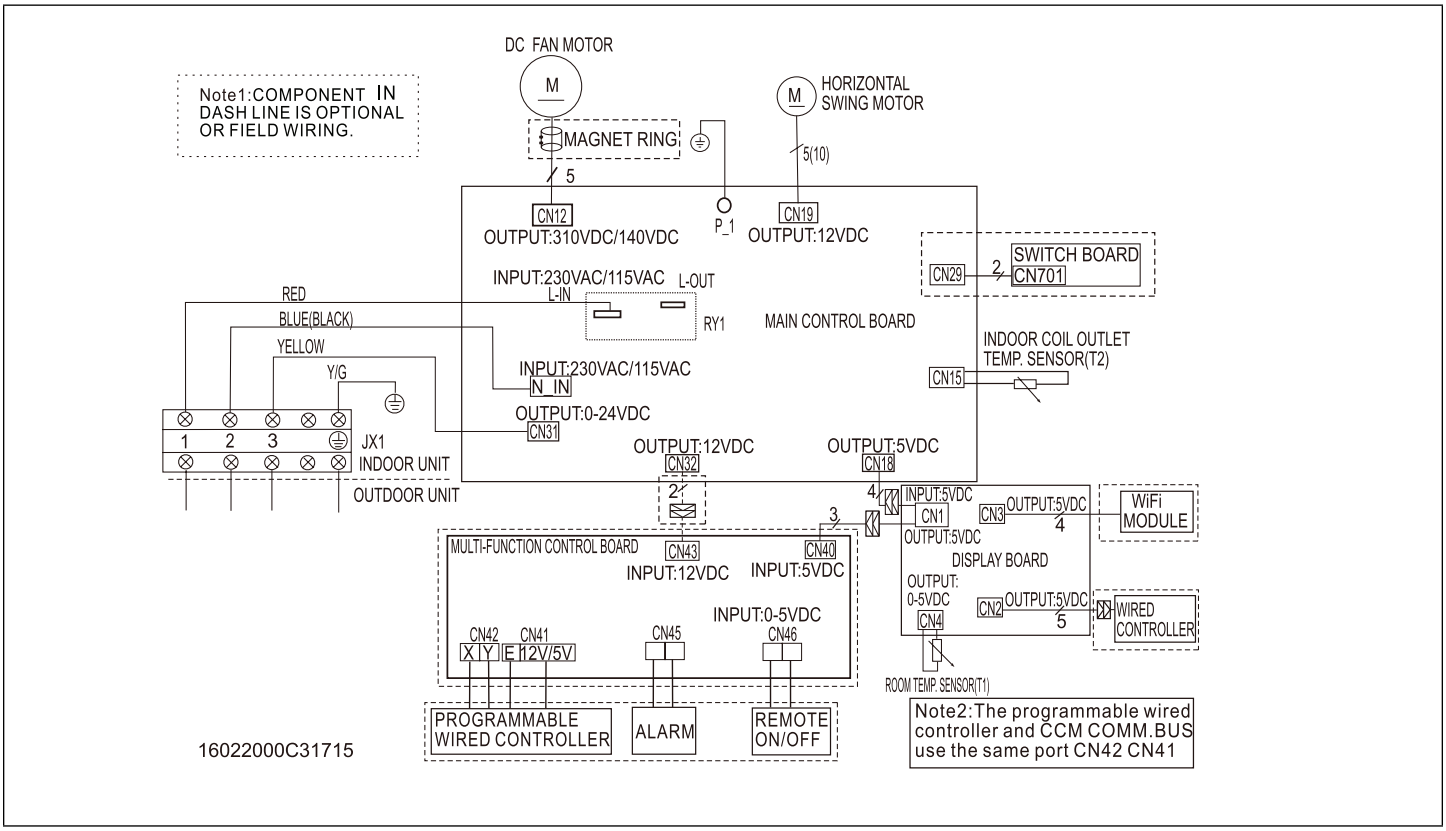


Figure 6. MWHB 09K,12K, and 18K - 115V and 208/230VAC Indoor Unit Wiring Diagram

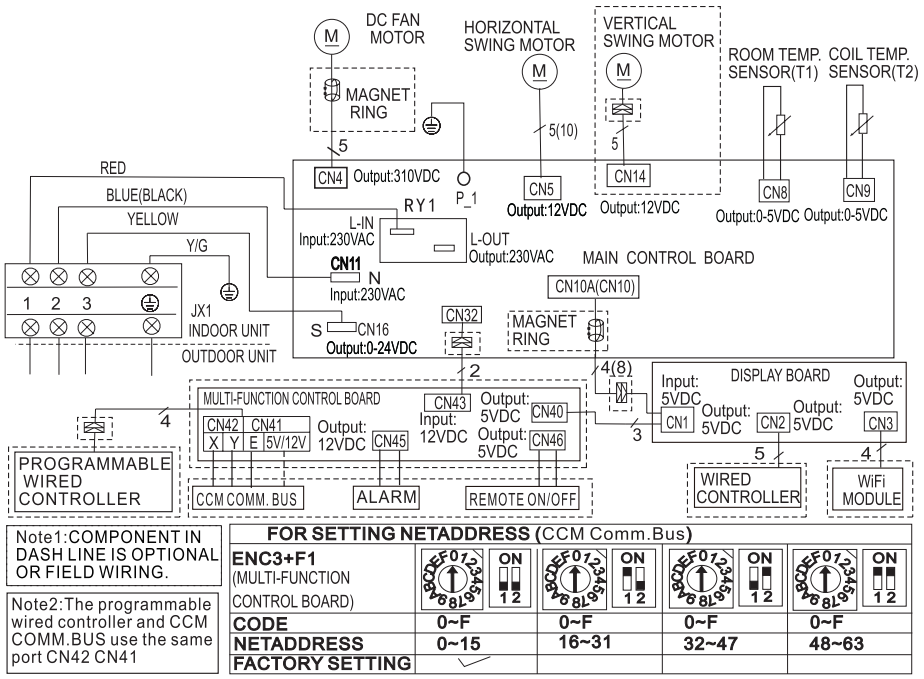


Figure 7. MWHB 24K 208/230VAC Indoor Unit Wiring Diagram

8.4. MHB Outdoor Unit

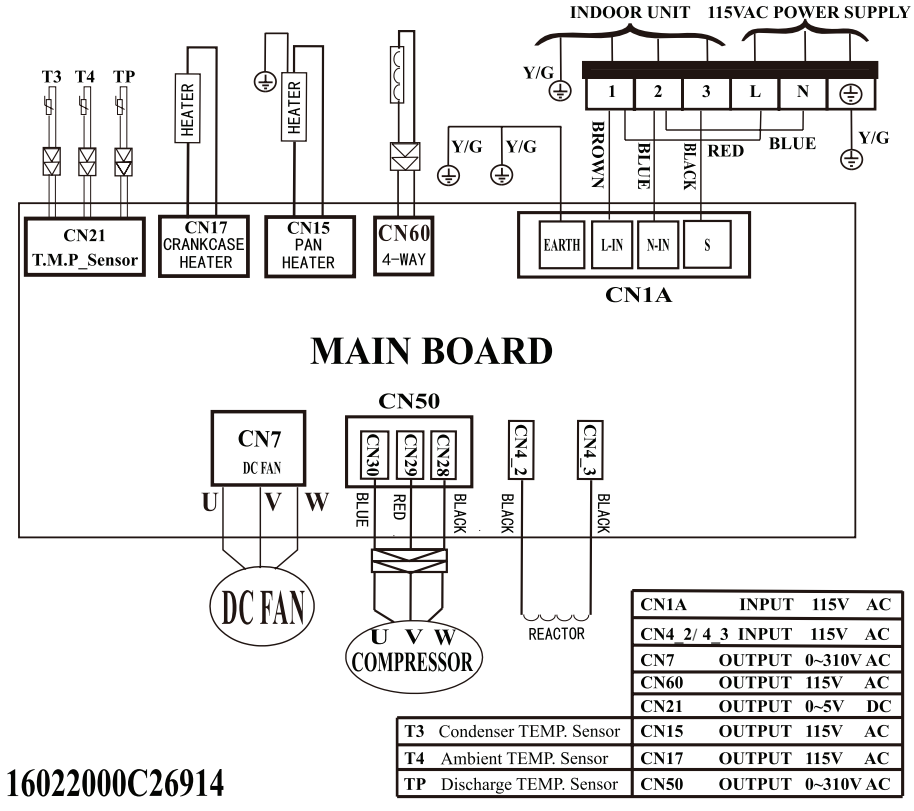


Figure 8. MHB 9K and 12K - 115VAC Outdoor Unit Wiring Diagram

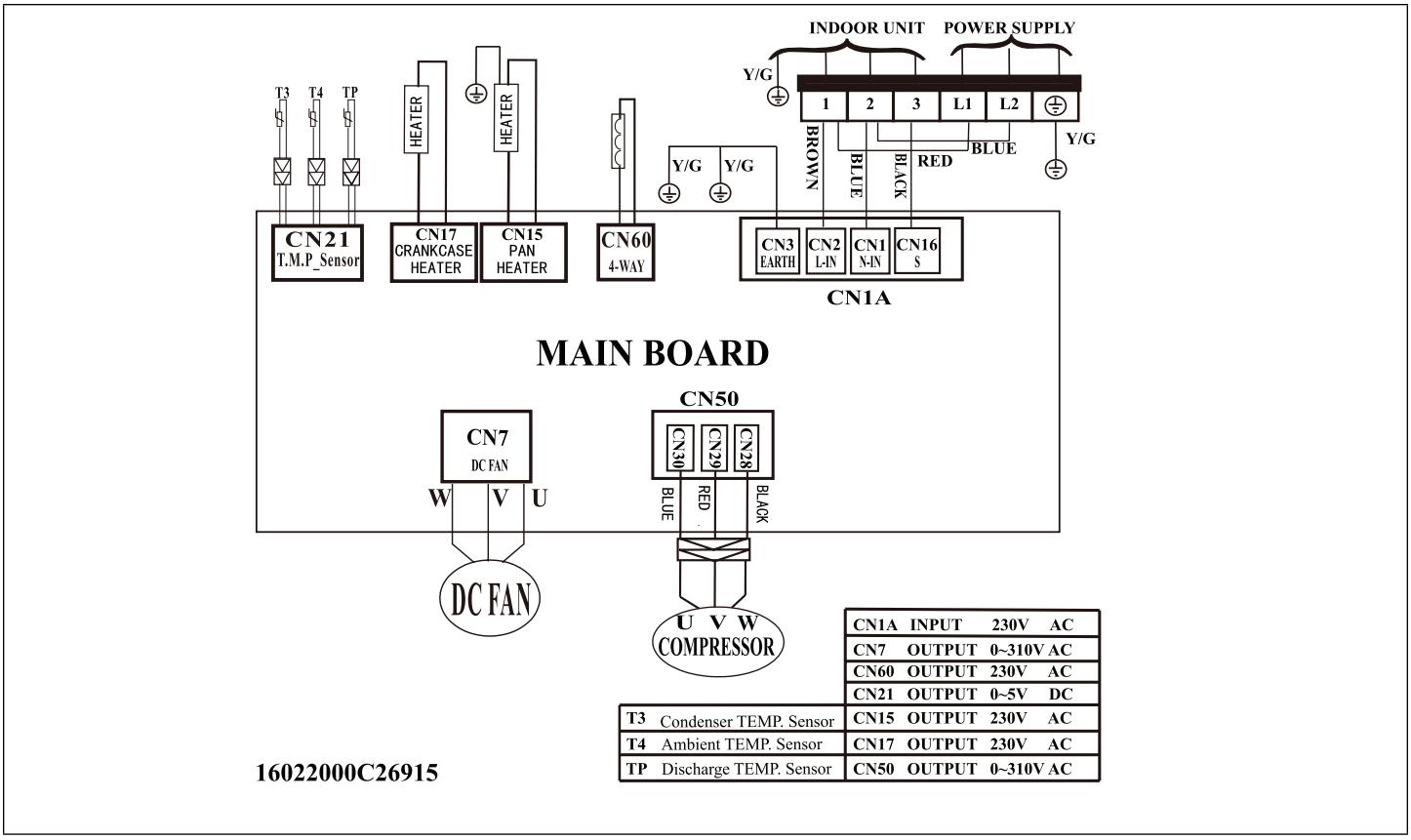


Figure 9. MHB 09K, 12K and 18K - 208/230VAC) Outdoor Unit Wiring Diagram

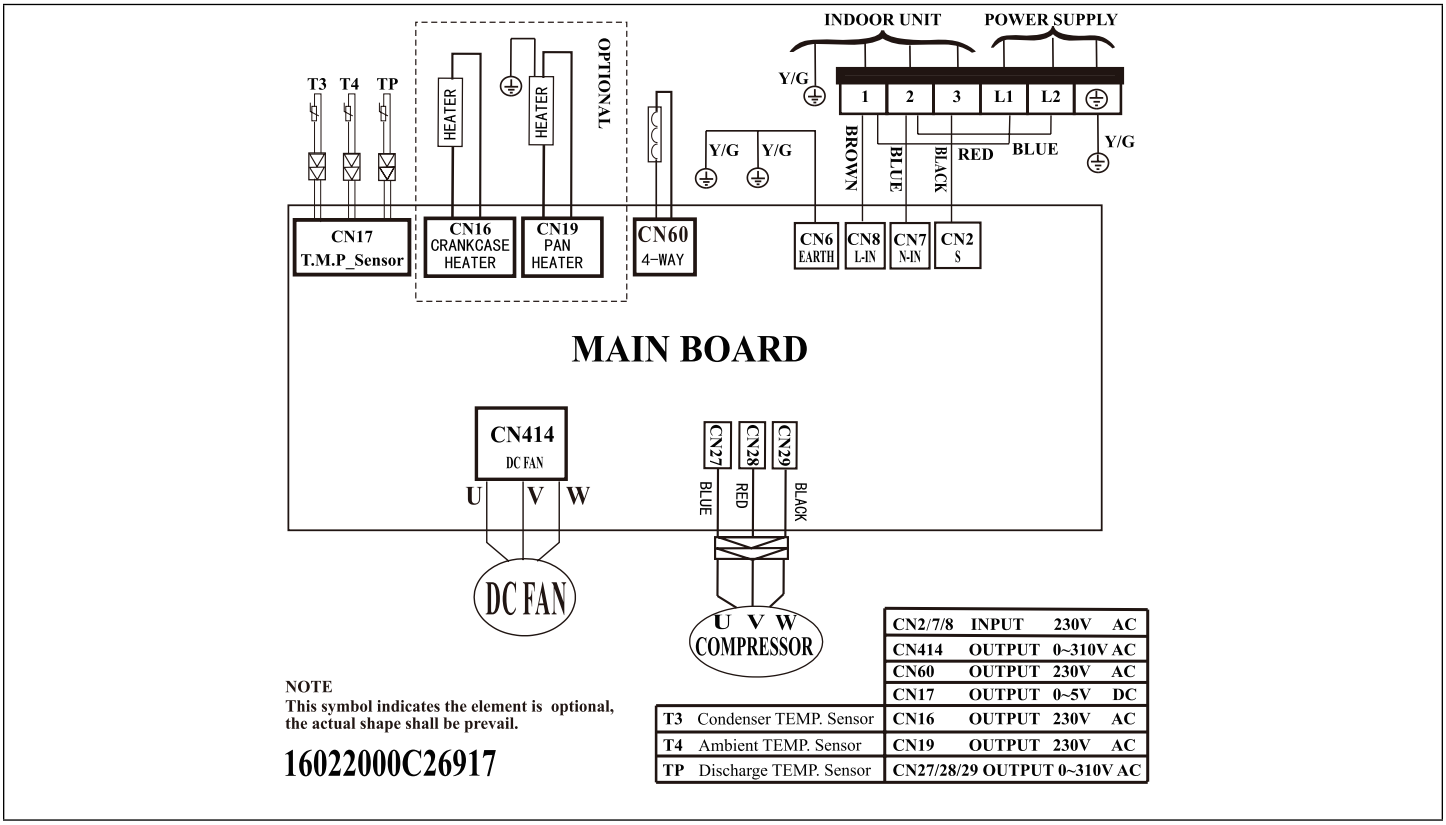


Figure 10. MHB 24K - 208/230VAC Outdoor Unit Wiring Diagram

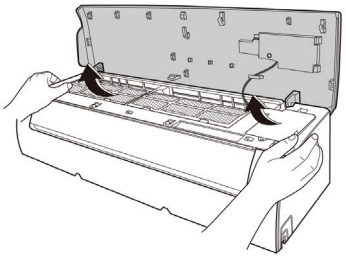
9. Indoor and Outdoor Unit Disassembly

9.1. MWCB and MWHB Unit Disassembly

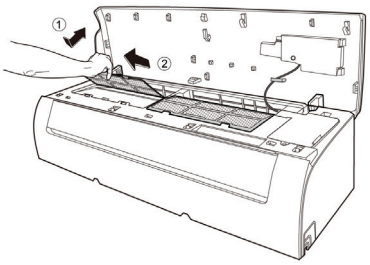
9.1.1. Front Panel Removal

Front Panel Removal

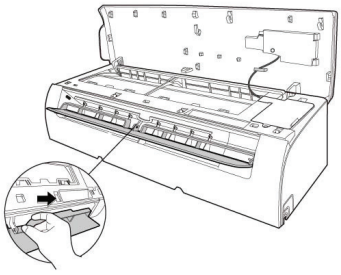
1. Hold the front panel by the tabs located on both sides and lift the panel up.



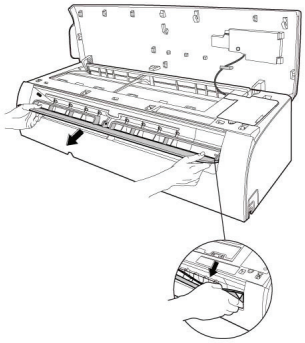
2. Push up the bottom of an air filter (step 1), and then pull it out downwards (step 2).



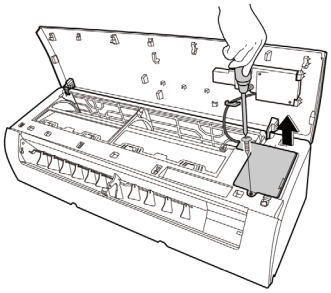
3. Open the horizontal louver and push the hook towards left to open it.



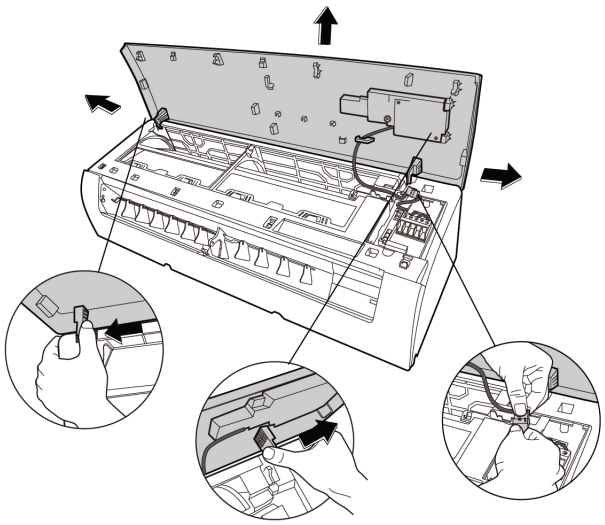
4. Bend the horizontal louver lightly by both hands to loosen the hooks, then remove the horizontal louver.



5. Pry the electrical cover by a screw driver, and rotate it towards left, then remove it.

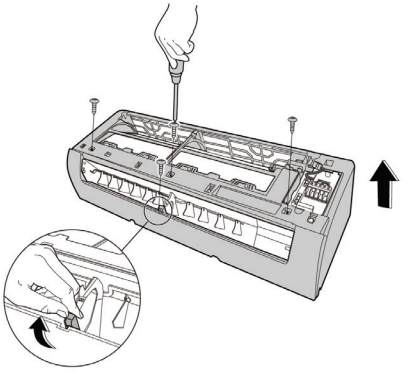


6. Disconnect the connector for display board.
7. Slide the front panel side to side to release each axis .

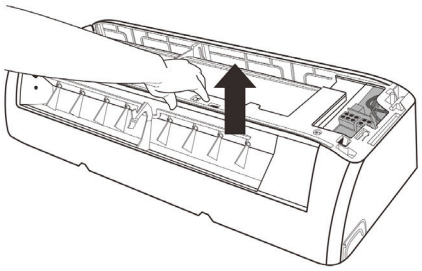


Front Panel Removal

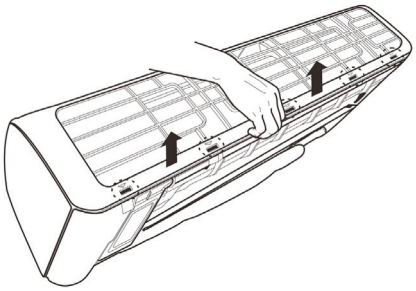
8. Open the screw cap and then remove the 3 screws.



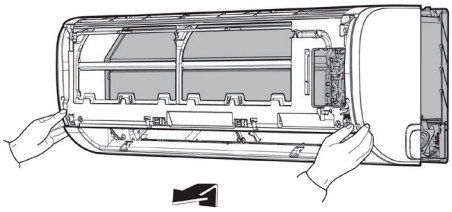
9. Release the hooks with hands.



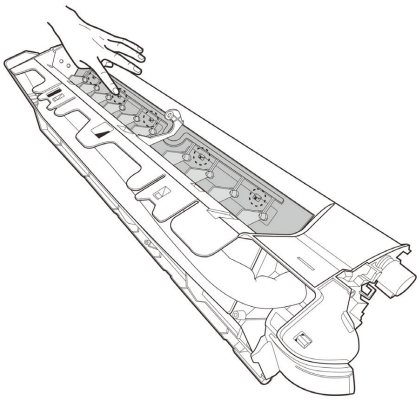
10. Release the 5 hooks in the back.



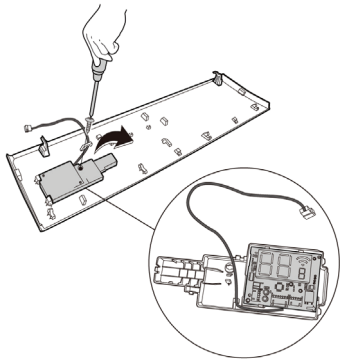
11. Pull out the panel frame while pushing the hook through a clearance between the panel frame and the heat exchanger.



12. Release the 5 hooks of the vertical blades, then pull the vertical blades right-ward and remove it

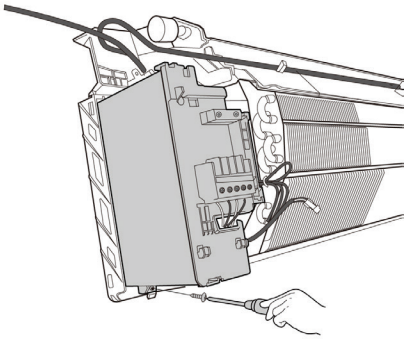


13. Remove 1 screw of the display board.
14. Rotate the display board in the direction shown in the right picture.

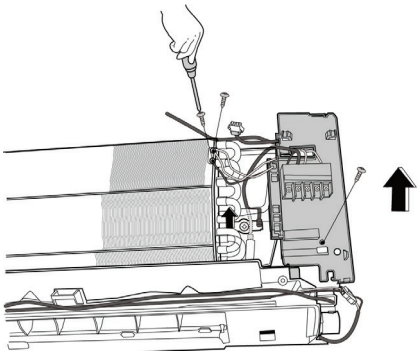


9.1.2. Control Board Removal

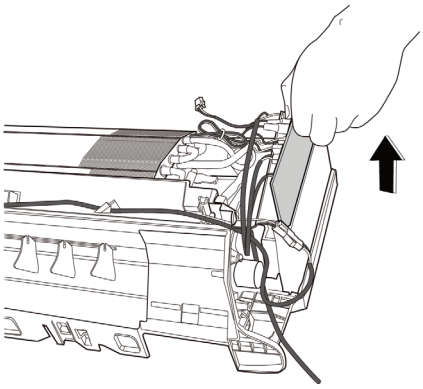
1. Remove the one screw securing the electrical control box sub-assembly.



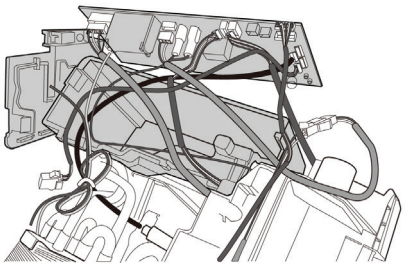
2. Cut the ribbon securing the T2 coil sensor and then pull out.
3. Remove the one screw securing the electronic control box and two grounding screws.



4. Pull out the electrical main board along the direction indicated in image.



5. Disconnect the connectors and remove main control board.

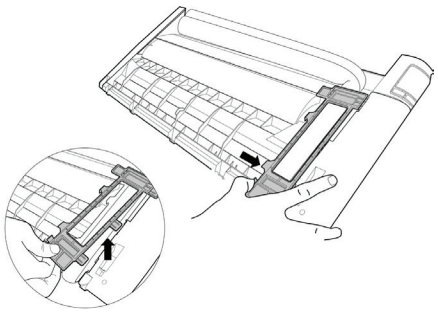


9.1.3. Evaporator Coil Removal

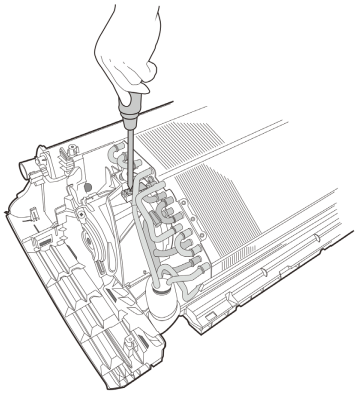
Evaporator Coil Removal

NOTE: *The front panel and control board will need to be remove prior to this procedure.*

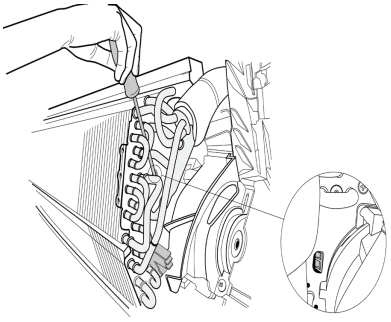
1. Disassemble the pipe holder located at the rear of the unit.



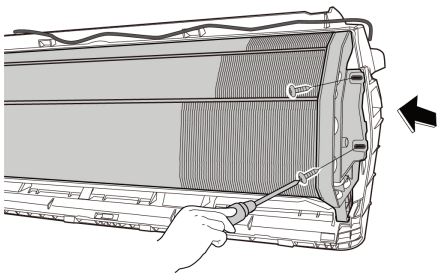
2. Remove the one screw on the evaporator located at the fixed plate



3. Remove one screw and release the hook on the evaporator.

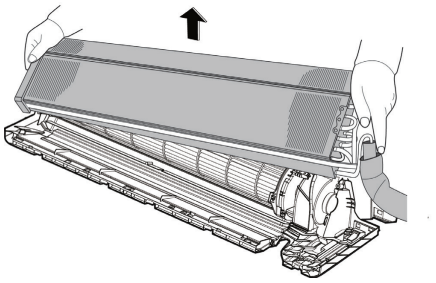


4. Remote the two screws on the evaporator located at the fixed plate.



Evaporator Coil Removal

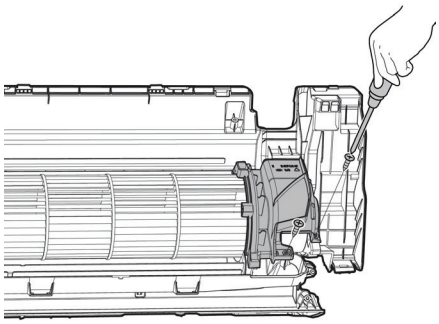
5. Pull out the evaporator



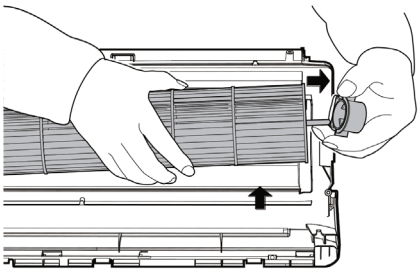
9.1.4. Fan Removal

NOTE: *The front panel, control box and evaporator coil must be removed prior to this procedure*

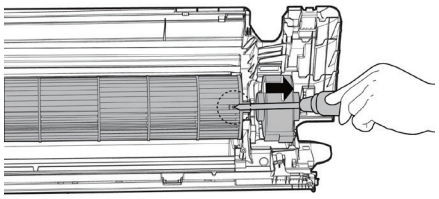
1. Remove the two screws and fan motor fixing board.



2. Remove the bearing sleeve.



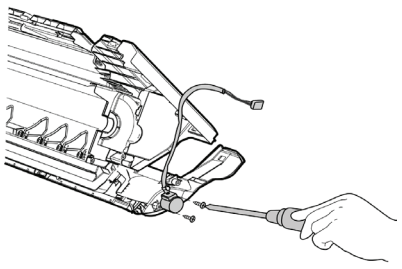
3. Remove the fixing screw.
4. Pull out the fan motor and fan assembly from the side.



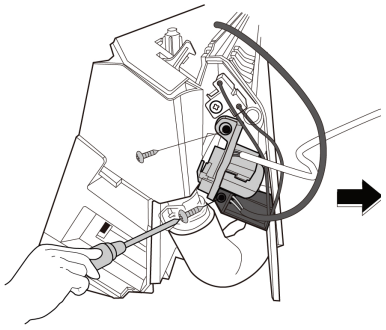
9.1.5. Step Motor Removal

NOTE: *The front panel, control box, evaporator coil and fan must be removed prior to this procedure*

1. Remove the two screws, then remove the horizontal swing motor.

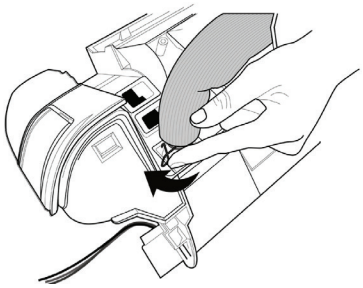


2. Remove one screw and then remove the vertical swing motor.
3. Remove one screw, then remove the ionizer generator.

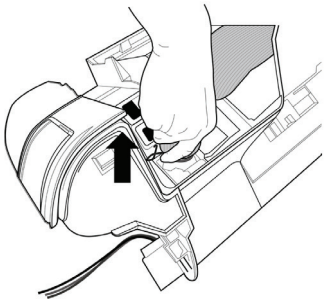


9.1.6. Drain Hose Removal

1. Rotate the fixed wire clockwise indicated in right image



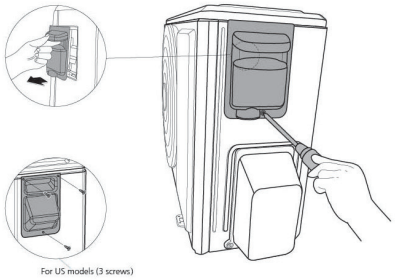
2. Pull up the drain hose to remove it.



9.2. Outdoor Unit Disassembly

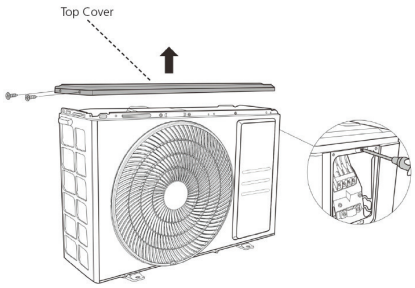
9.2.1. MCB012S4S-1L, MCB009S4S-1P and MCB012S4S-1P

1. Disconnect power to the system.
2. Remove the one screw securing the big handle and then remove the big handle.

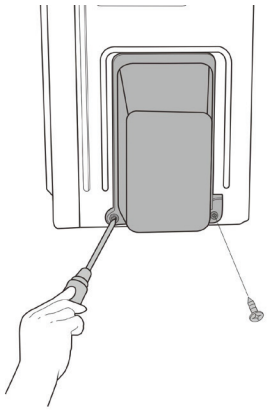


3. Remove the three screws securing the top cover and remove the top cover.

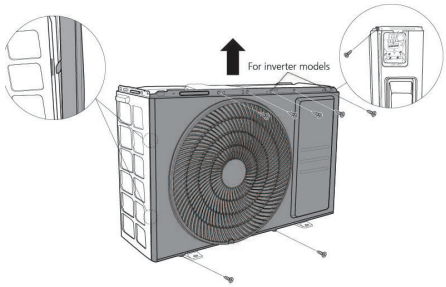
NOTE: *One of the screws is located underneath the big handler.*



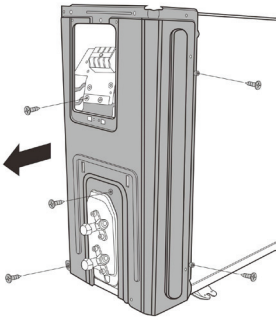
4. Remove the two screws securing the upper cover plate and then remove plate.



5. Remove the eight screws securing the front cover and remove the cover.

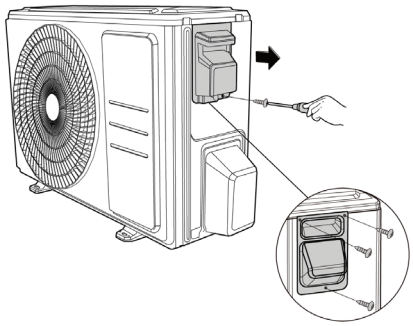


6. Remove the five screws securing the right panel and then remove panel.



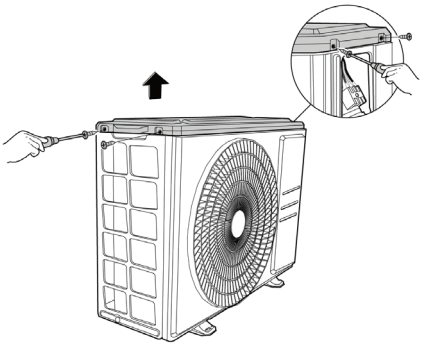
9.2.2. MCB018S4S-1P, MCB024S4S-1P, MHB009S4S-1L, MHB012S4S-1L MHB009S4S-1P, MHB012S4S-1P and MHB018S4S-1P

1. Disconnect power to the system.
2. Remove the one screw securing the big handle and then remove the big handle.

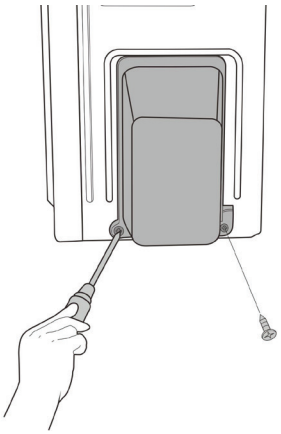


3. Remove the four screws securing the top cover and remove the top cover.

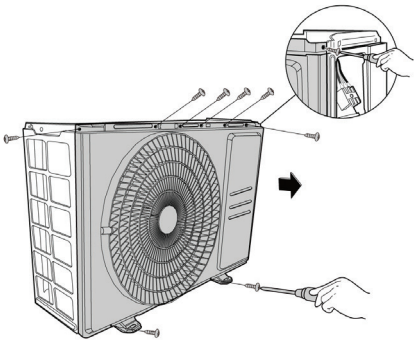
NOTE: *One of the screws is located underneath the big handler.*



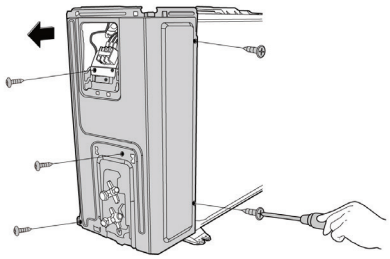
4. Remove the two screws securing the cover plate and then remove plate.



5. Remove the nine screws securing the front cover and remove the cover.

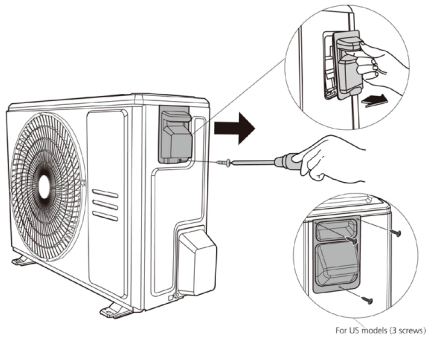


6. Remove the five screws securing the right panel and then remove panel.



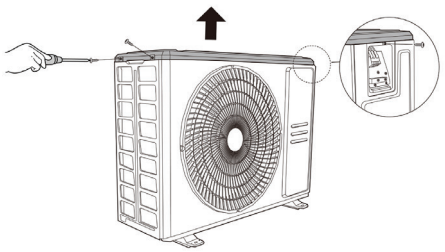
9.2.3. MHB024S4S-1P

1. Disconnect power to the system.
2. Remove the one screw securing the big handle and then remove the big handle.

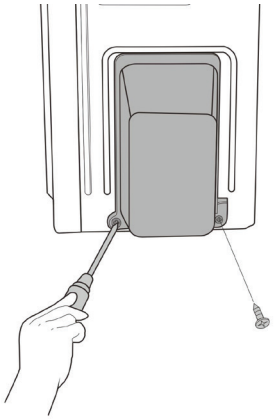


3. Remove the three screws securing the top cover and remove the top cover.

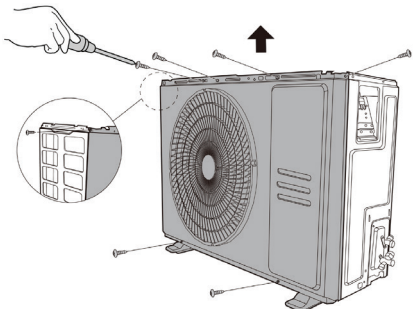
NOTE: *One of the screws is located underneath the big handler.*



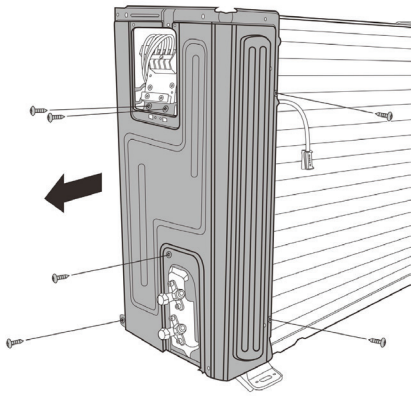
4. Remove the two screws securing the cover plate and then remove plate.



5. Remove the nine screws securing the front cover and remove the cover.



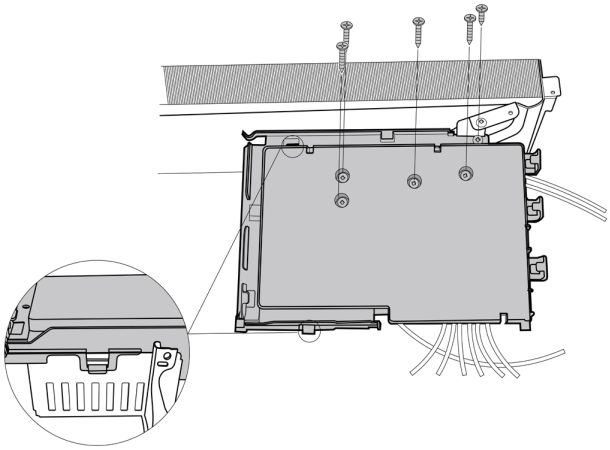
6. Remove the six screws securing the right panel and then remove panel.



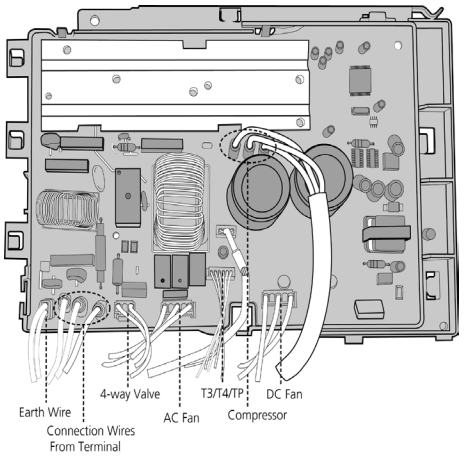
9.3. Control Board Removal

9.3.1. MCB024S4S-1P and MHB024S4S-1P

1. Remove the five screws and disconnect the hooks to open the electronic control box cover.

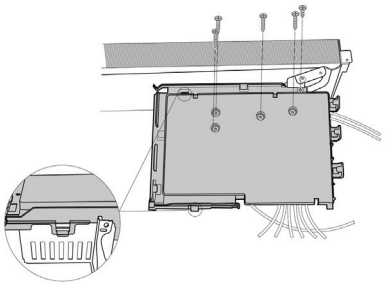


2. Disconnect the connector for fan *motor from the electronic control board*.
3. Remove the connector for the compressor.
4. Pull out the two blue wires connected with the four way valve
5. Pull out connectors of the condenser coil temperature sensor (T3), outdoor ambient temperature sensor (T4) and discharge temperature sensor (TP).
6. Disconnect the electronic expansion valve wire.
7. Remove the connector for the DR *and reactor*
8. Then remove the electronic control *board*.

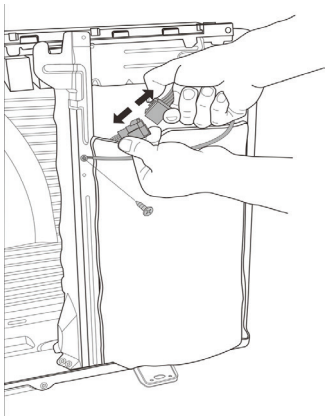


9.3.2. MCB009S4S-1P, MCB012S4S-1P, MCB018S4S-1P, MHB009S4S-1P, MHB012S4S-1P, and MHB018S4S-1P

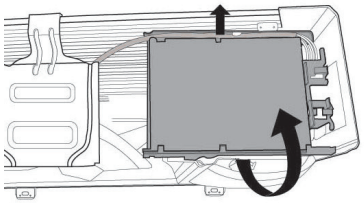
1. Remove the five screws and disconnect the hooks to open the electronic control box cover.



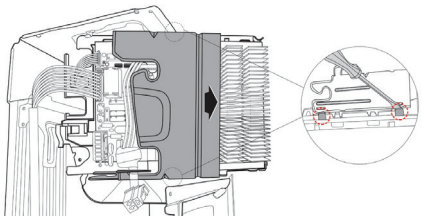
2. Disconnect the compressor connector and remove the grounding screw.



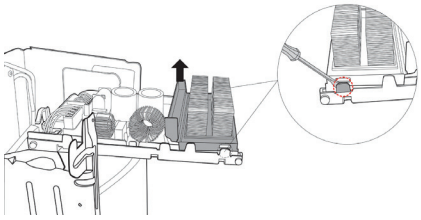
3. Pull out the wires from electrical supporting plate and turn over the electronic control assembly.



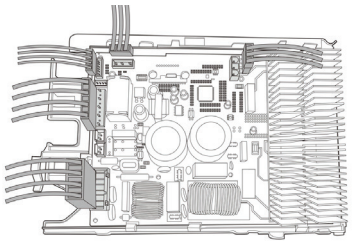
4. Remove the four hooks to remove the control box sub-assembly.



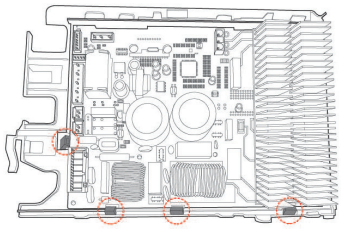
5. Remove the two hooks to remove the fixing board.



6. Disconnect the connectors from the electronic control board.

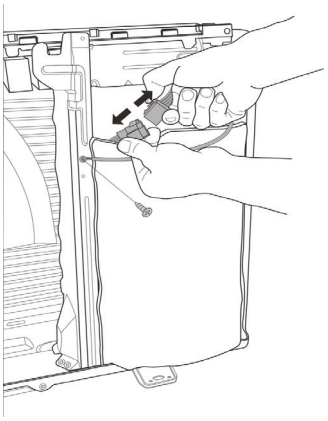


7. Then remove the four hooks securing the electronic control board(

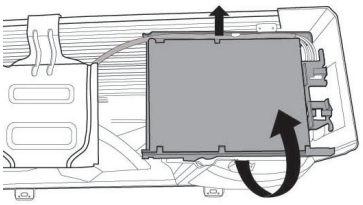


9.3.3. MCB012S4S-1L, MHB009S4S-1L and MHB012S4S-1L

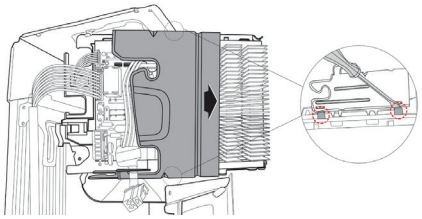
1. Disconnect the compressor connector and remove the grounding screw.



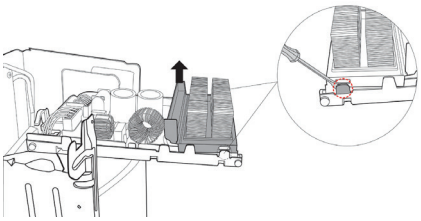
2. Pull out the wires from electrical supporting plate and turn over the electronic control assembly.



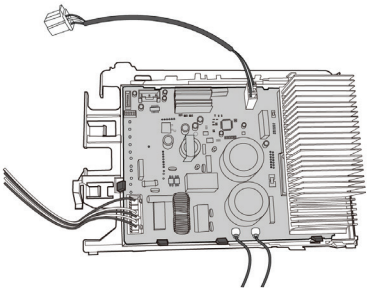
3. Remove the four hooks to remove the control box sub-assembly.



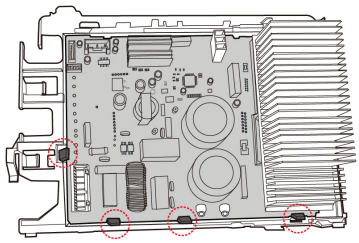
4. Remove the two hooks to remove the fixing board.



5. Disconnect the connectors from the electronic control board.



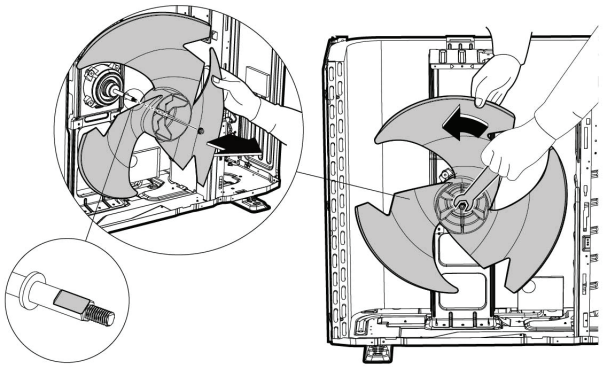
6. Then remove the four hooks securing the electronic control board(



9.4. Outdoor Unit Fan and Fan Motor Disassembly (All Models)

9.4.1. Fan Disassembly

1. Remove the nut securing the fan with a spanner
2. Remove the fan.



9.4.2. Fan Motor Removal

1. Remove the four screws securing the fan motor.
2. Remove the fan motor.